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MagneW3000 FLEX+/PLUS+ Smart Electromagnetic Flowmeter Converter Model MGG10C-M/P/R/S/T MGG14C-M/P/R User's Manual



Yamatake Corporation

CM2-MGG310-2001
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NOTICE

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Safety

About this manual

This manual contains information and warnings that must be observed to keep the model MGG10C/MGG14C MagneW3000 FLEX$^+$/PLUS$^+$ Flowmeter operating safely. Correct installation, correct operation and regular maintenance are essential to ensure safety while using this device.

For the correct and safe use of this flowmeter, it is essential that both operating and service personnel follow generally accepted safety procedures in addition to the safety precautions specified in this manual.

The following symbols are used in this manual to alert you to possible hazards:

⚠ WARNING
Denotes a potentially hazardous situation which, if not avoided could result in death or serious injury.

⚠ CAUTION
Denotes a potentially hazardous situation which, if not avoided could result in minor injury or damage to device.

Safety messages

Carefully read this section before installing or operating this device.

⚠ WARNING
ELECTRIC SHOCK HAZARD! Turn the power supply OFF before opening the converter cover.

⚠ CAUTION
Switch the control equipment to manual control before terminating flowmeter operation and shutting off the output to the control equipment. This action prevents the power shut-off from directly affecting the control equipment.

⚠ CAUTION

Install the flowmeter in a location with an ambient temperature of -25 °C to 60 °C (-13 °F to 140 °F) and an ambient humidity of 5 to 100% RH to prevent equipment malfunction or output errors.

⚠ CAUTION

Do not install the flowmeter near high-current power lines, motors or transformers to prevent damage from electromagnetic induction, which can cause equipment malfunction or output errors.

⚠ CAUTION

Do not install the flowmeter in a location subject to direct sunlight, wind, rain, severe vibration, or in a highly corrosive atmosphere. The converter and detector can be damaged.

⚠ CAUTION

Be sure to ground the welding power transformer when welding near the flowmeter to avoid output errors.

⚠ CAUTION

DO NOT use the flowmeter to ground a welder. It can damage the flowmeter.

MagneW3000 FLEX+/PLUS+ Electromagnetic Flowmeter CE Conformity Supplement

CE CONFORMITY: This product is in conformity with the protection requirements of the following European Council Directive: **89/336/EEC**, the EMC Directive and **73/23/EEC**, Low Voltage Directive. Conformity of this product with any other "CE Mark" Directive(s) shall not be assumed.

EMC Directive/Standard	PC	Conformity	Notes
ELECTROMAGNETIC COMPATIBILITY: 89/336 EEC, EMC Directive			
EMISSIONS: EN 61326-1997+A1:1998+A2:2001+A3:2003 classA Electrical equipment for measurement, control and laboratory use			
CISPR 16-1-1999,CISPR 16-2-1996, Group 1, Class A, Industrial Control Equipment, 150 KHz-1000 MHz		0.15MHz-0.5MHz quasi-peak limit 79dB (uV/m) at 10 m average limits 66dB (uV/m) at 10 m 0.5MHz-30MHz quasi-peak limit 73dB (uV/m) at 10 m average limits 60dB (uV/m) at 10 m 30MHz-230MHz quasi-peak limit 40dB (uV/m) at 10 m 230MHz-1000MHz quasi-peak limit 47dB (uV/m) at 10 m	1
IMMUNITY: **EN 61326-1997+A1:1998+A2:2001+A3:2003 AnnexA,** Electrical equipment for measurement, control and laboratory use, Industrial locations		**PERFORMANCE:** Unless otherwise noted, the performance of this product, at the specified levels of electromagnetic interference, is within the specifications for "Performance Under Rated Conditions,"	
EN 61000-4-2-1995+A1:1998+A2:2001 (IEC 1000-4-2-1995), ESD, Electrostatic Discharge	B B	±4 kV Contact ±8 kV Air	
EN 61000-4-3-2002+A1:2002(IEC 1000-4-3-1995), Radiated RF Fields, 80 -1000 MHz	A	10 V/m 1kHz,AM80%	1
EN 61000-4-4-1995+A1:1995+A2:2001 (IEC 1000-4-4-1995), Electrical Fast Transients/Burst	A	±2 kV AC Power ±1 kV I/O signal/control	1
EN 61000-4-5-1995+A1:2001 (IEC 61000-4-5-1995) Surge	B	±1kV Line to line: Power Lines ±2kV Line to ground: Power Lines ±1kV Line to ground: I/O signal/control Lines	1
EN 61000-4-6-1996+A1:2001 (IEC 61000-4-6-1996) Conducted Radio-frequency, 150 KHz - 80 MHz	A	3V	1
EN 61000-4-8-1993+A1:2001(IEC 61000-4-8-1993) Power frequency magnetic field	A	30A/m 50Hz	1
EN 61000-4-11-1994+A1:2001 (IEC 61000-4-11-1994) Voltagr Dip/short iterruptions	B	0.5cycle,each polarity/100%	

NOTES:

PC = Performance Criteria

1. Twist pair cables required for all I/O interface circuits.
   In case of remote model two core double shield cable in metal conduit pipe required for the input line in connection with detector.

LV Directive	Conformity
LOW VOLTAGE DIRECTIVE: 73/23/EEC	**EN 61010-1:2001**(IEC61010-1:2001), Safety requirements for electrical equipment for measurement, control and laboratory use Part 1: General requirements

MagneW3000 FLEX+/PLUS+ Electromagnetic Flowmeter Documentation Supplement

1. Mains supply

The symbol for a.c. or d.c. on the name plate is as follows:

~ for a.c. power supply

⎓ for d.c. power supply

2. Fuse marking

⚠ The fuse cannot be replaced by the operator.

Fuse rating and electric characteristics are as follows:

Fuse rating: Voltage 250V

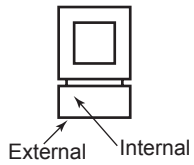
Current 3A

Manufacturer type:239003 (LITTEL FUSE)

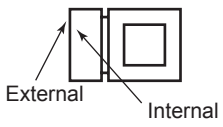
3. Grounding (Earthing)

Protective grounding (earthing) should be connected as shown in Operator's Manual.

The MagneW3000 FLEX+/PLUS+ has protective grounding (earthing) terminals in the terminal box and on the external surface of its casing (see figure).



Remote models



Integral models

An external switch or circuit-breaker must be installed near the MgneW3000 FLEX+/ PLUS+ on the power line.

4. Equipment operation

⚠ Power line is connected to commercial power. The terminal cover must not be opened when power is on.

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Chapter 1: Introduction

This chapter contains an overview of the model MGG10C/MGG14C MagneW3000 FLEX+/PLUS+ Flowmeter. It provides definitions for all the major parts of the converter.

MagneW3000 FLEX+/PLUS+ Flowmeter

Thank you for purchasing the Yamatake Corporation model MGG10C/MGG14C Flowmeter. This system features:

- Digital panel display
- Intuitive, versatile operator interface with large characters and backlit liquid crystal display (LCD)
- I/O Capacity

Main components

The model MGG10C/MGG14C MagneW3000 FLEX+/PLUS+ Flowmeter consists of a detector and a converter which operate on the principles of Faraday's law.

Integral - The converter is mounted directly on the detector and they are installed as an integrated unit on the fluid pipe.

Remote - The converter and detector are installed separately and connected together via cables

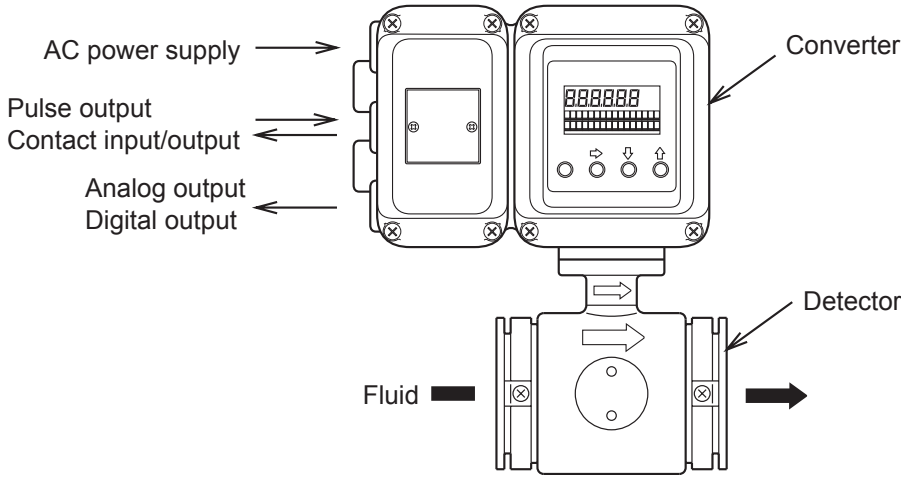


Figure 1-1 Integral System

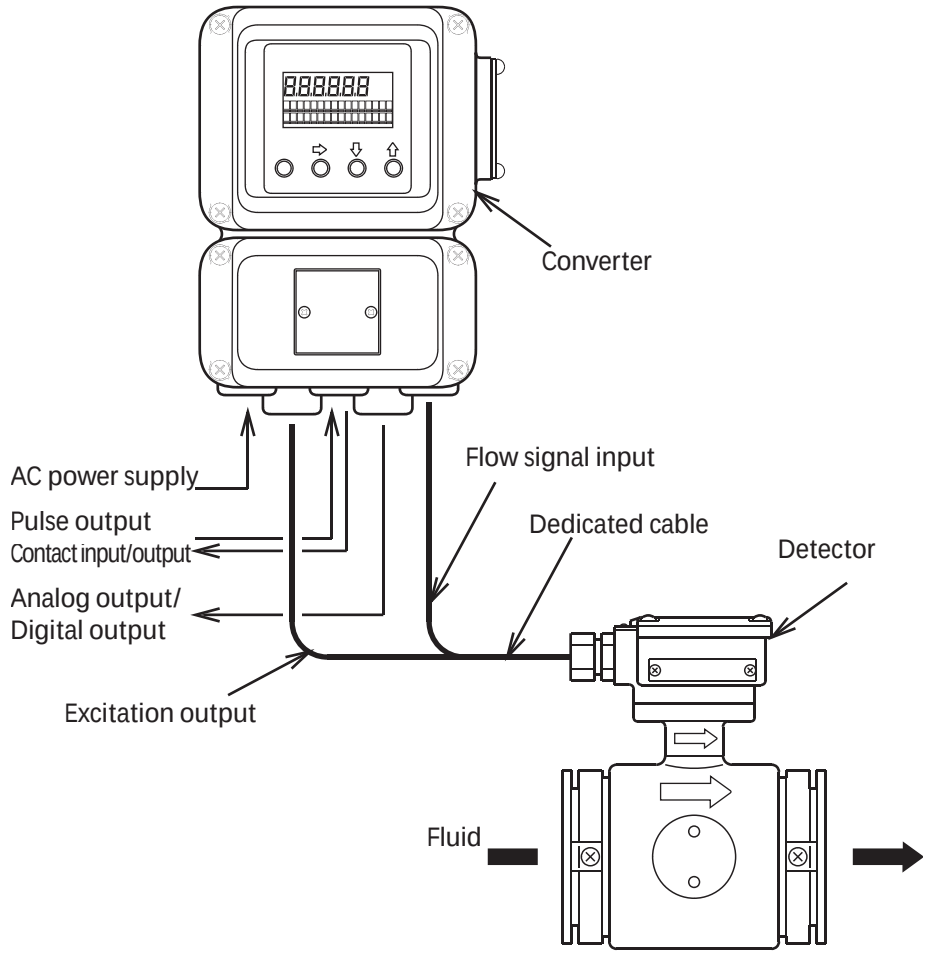


Figure 1-2 Remote System

Analog output and digital output

Introduction

The choice of either an analog output or digital output system configuration depends on whether or not you want to use the digitally enhanced (DE) communication mode.

Analog output (4 to 20 mA DC output)

In analog mode, the flowmeter sends the instantaneous flow rate as a proportional 4 to 20 mA output signal to a controller or a recorder in the control system.

Digital output (DE output)

A flowmeter in the DE mode can communicate in a direct digital fashion with Yamatake or Honeywell DCS system. The digital signal can include flow rate, flowmeter database, and self-diagnostics.

Switching output mode

The analog/digital output mode is selectable.

System configuration for analog output (4 to 20 mA DC output)

Introduction

In the analog mode, the flowmeter can be configured with or without SFC communications.

WITHOUT the communication function

The DC power supply that transmits the analog output, when the flowmeter is used without SFC communications, is built into the product.

The analog output signal is transmitted directly to the host control system.

- Analog output range: 0.8 to 22.4 mA (-20 to +115%)
- Resistive load: 0 to 600 Ω

WITH HART communication function

The DC power supply that transmits the analog output and HART communication, when the flowmeter is used with the HART communications, is built into the product.

- Analog output range: 3.2 to 22.4 mA (-5 to +115%)
- Resistive load: 0 to 600 Ω

WITH the communication function (SFC or HART)

When the flowmeter is used in the analog mode with SFC communications, an external power supply (DC power) and external resistive load (minimum 250 Ω) is required. HART communication is also available with the external power supply and resistive load.

- Analog output range: 3.2 to 22.4 mA (-5 to +115%)
- DC power: 16 to 45V DC
- Maximum value of external resistive load is calculated:

$$\textit{Maximum resistive load } (\Omega) = \frac{\textit{External power supply for communication - 8.5V}}{0.025}$$

⚠ CAUTION

For systems WITH the SFC communication function, failure to install the external power supply and the external resistive load, will prevent the analog output from being accepted on the receiving instrument side. Be sure to install the external power supply and the external resistive load as specified.

System configuration WITHOUT the communication function

Figure 1-3 shows a sample system configuration without the communication. In this system, the device measures the flow rate and outputs analog 4 to 20mA DC signal to the Host Control System.

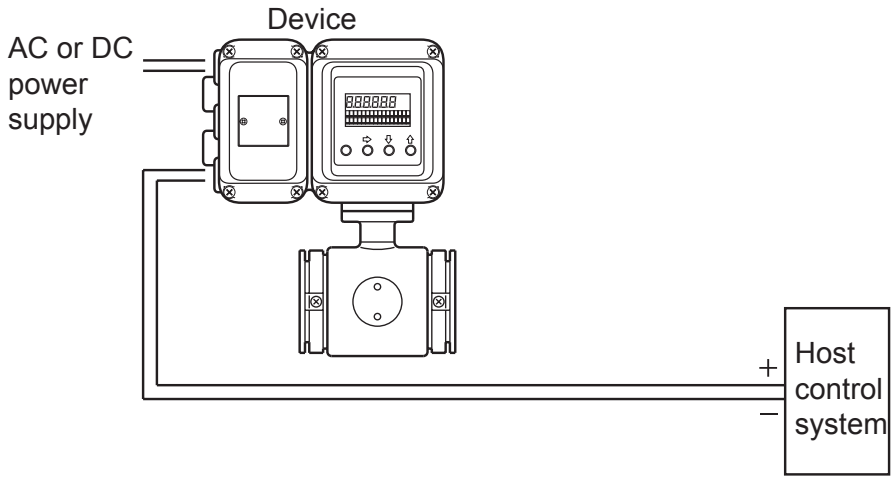


Figure 1-3 System configuration of analog output WITHOUT communication function

Smart Electromagnetic Flowmeter (device)

- Measures flow rate and outputs an analog signal.

System configuration WITH the HART communication function with the internal power supply

Figure 1-4 shows a sample system configuration in with the HART communication.

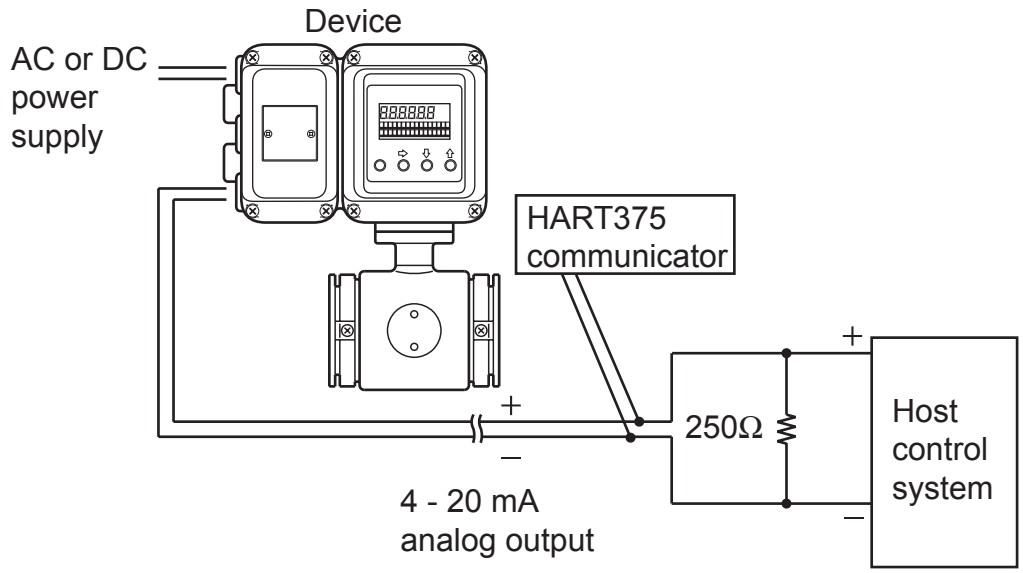


Figure 1-4 System configuration of with the HART communication with internal power supply

Smart Electromagnetic Flowmeter (device)

- Measures flow rate and outputs an analog signal.

HART Communicator:

- Communicate with the MagneW3000 FLEX^{+}/PLUS^{+} and configure the date of the MagneW3000 FLEX^{+}/PLUS^{+}. For the HART communication by the HART 375 communicator, the necessary DD file needs to be downloaded.

System configuration WITH the SFC or HART communication function with the external power supply

Figure 1-5 shows a sample system configuration in which the instantaneous flow rate measured by the unit is output with a 4 to 20 mA DC analog signal.
In order to enable communications, a DC power supply and a resistance of 250Ω or more must be installed on the receiving side.

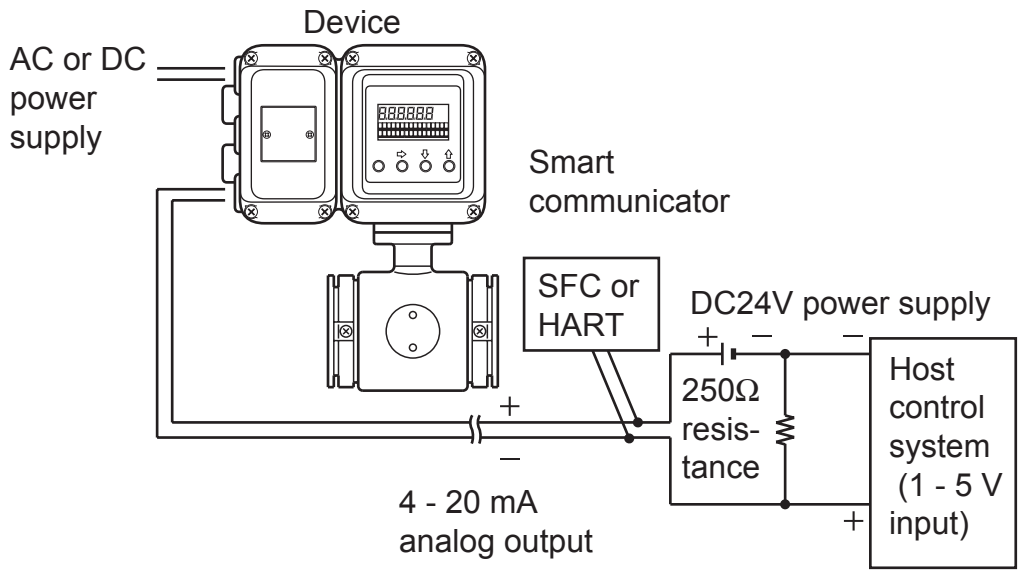


Figure 1-5 System configuration for analog output WITH the communication function (example setup)

Smart Electromagnetic Flowmeter (device)

• Measures flow rate and outputs an analog signal instantaneous flow rate.

Smart Communicator (SFC):

• Communicates with the device to read data and change the device settings.

• The SFC version must be V7.0 or later.

HART Communicator:

• For the HART communications by the HART 375 communicator, the neccesary DD file needs to be downloaded.

System Configuration for Digital Output (DE Output)

System configuration

Figure 1-5 shows a system configuration in which the flow rate measured by the unit, the database in the unit, and self-diagnostics are output using the DE (Digital Enhancement) protocol (rules for digital signal communication).

In this system, the DE protocol-based digital signal transmitted from the unit is output to the control system after conversion to an analog signal at the smart protocol converter (SPC). Or, the digital signal is directly transmitted to the control system, if it is capable of receiving the DE protocol-based signal directly.

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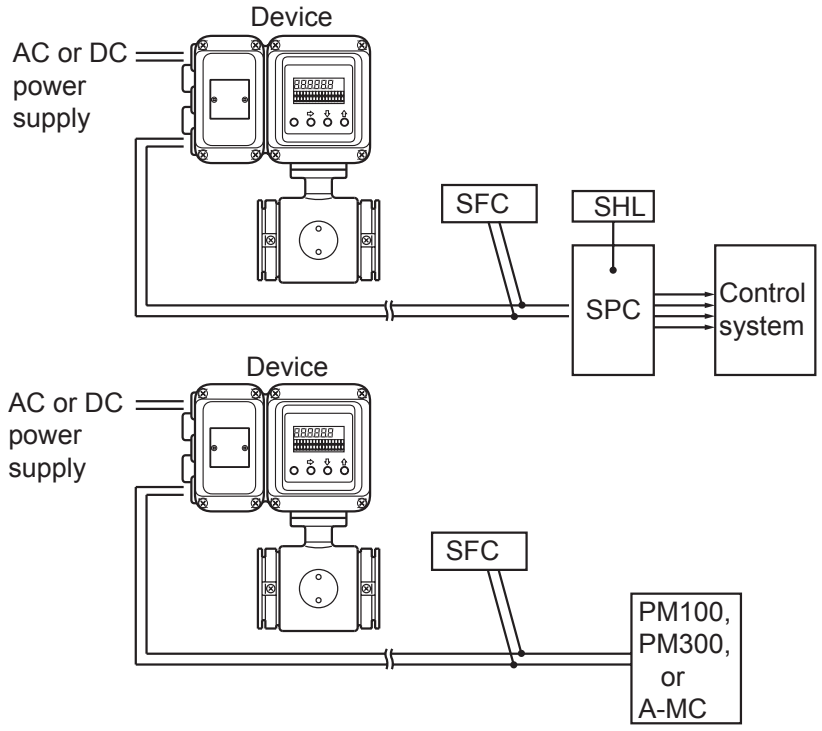


Figure 1-6 System configuration for digital output

Smart Electromagnetic Flowmeter (device)
Measures flow rate and outputs the instantaneous flow rate and unit self-diagnostics using a digital signal.

Smart protocol converter (SPC)
Converts the DE protocol-based digital signal into a 4 to 20 mA or 1 to 5 V DC analog signal for output.

Smart handy loader (SHL)
Used to change the SPC settings.

Smart communicator (SFC)

- Used to communicate with the device to read data and change the device settings.

PM100

- Simultaneously executes such functions as process control on the UCN, regulatory control, sequencing, calculation, and process input/output.

The converter consists of the components shown in the figure below.

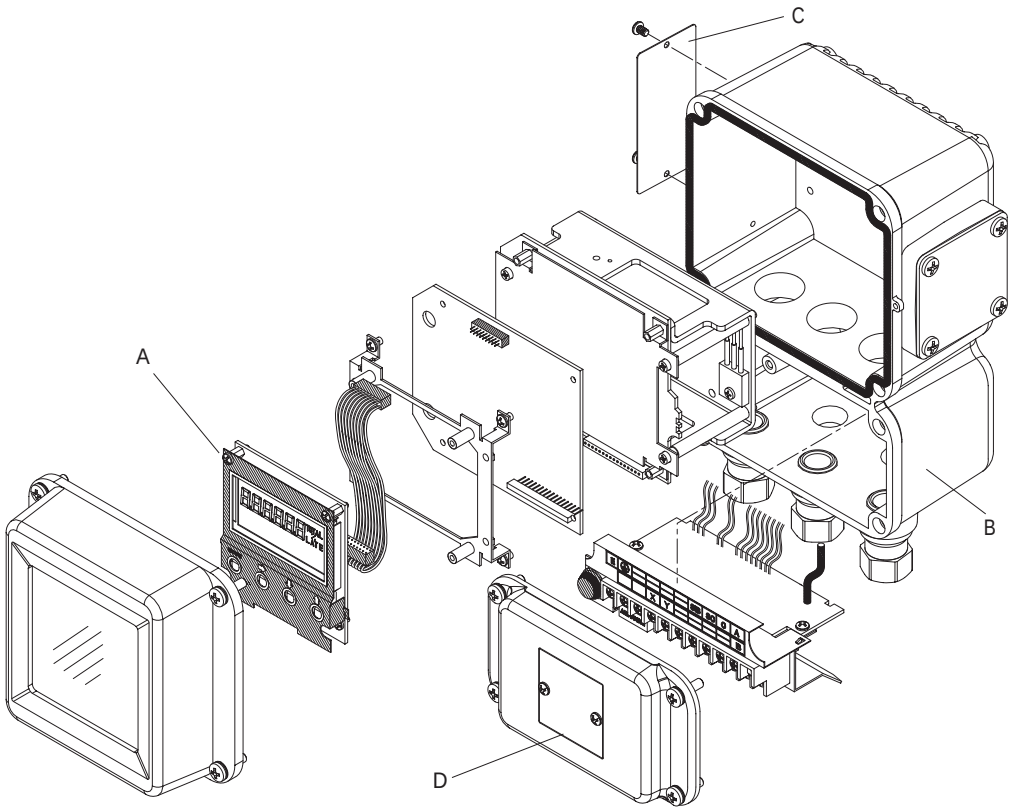


Figure 1-7 Parts of the converter

Converter

• Converts electromotive force by the detector to the flow rate signal.

• Transmits the analog output or the digital output as the flow rate signal.

Data setting device (A)

• Displays the flow rate and the totalized value.

• The Data can be configured through the four infrared sensor keys.

Terminal box (B)

• Encloses the inputs/outputs terminals.

• Equipped with 12kV, 1000A lightning arrestor.

Name plate (C)

• Indicates model numbers, product numbers and the detector factor (EX).

Tag number plate (D)

• Indicates the tag number as specified in the product order.

Approval of this Device

Overview

If the basic model number is MGG14C and 1/2 NPT wiring connection is selected and style code is selected as “N”, this device functions as an FM/CSA, non-incentive-approved model. In this case, the installation standards described in this section must be followed.

Installation of this device

FM/CSA Nonincendive model

THIS EQUIPMENT IS SUITABLE FOR USE IN CLASS I, DIVISION 2, GROUPS(A, B, C, D), CLASS II/III, DIVISION 2, GROUPS (F, G), OR NON-HAZARDOUS LOCATIONS ONLY.

⚠ CAUTION

- Power supply and internal voltage of ordinary equipment to the earth shall not exceed AC250V 50/60HZ, DC250V in case of normal /formal conditions.
- Ambient temperature is from - 25 to 60C
- Process temperature is from -40 to 160C (Remote model).
- Process temperature is from -40 to 120C(Integral model)

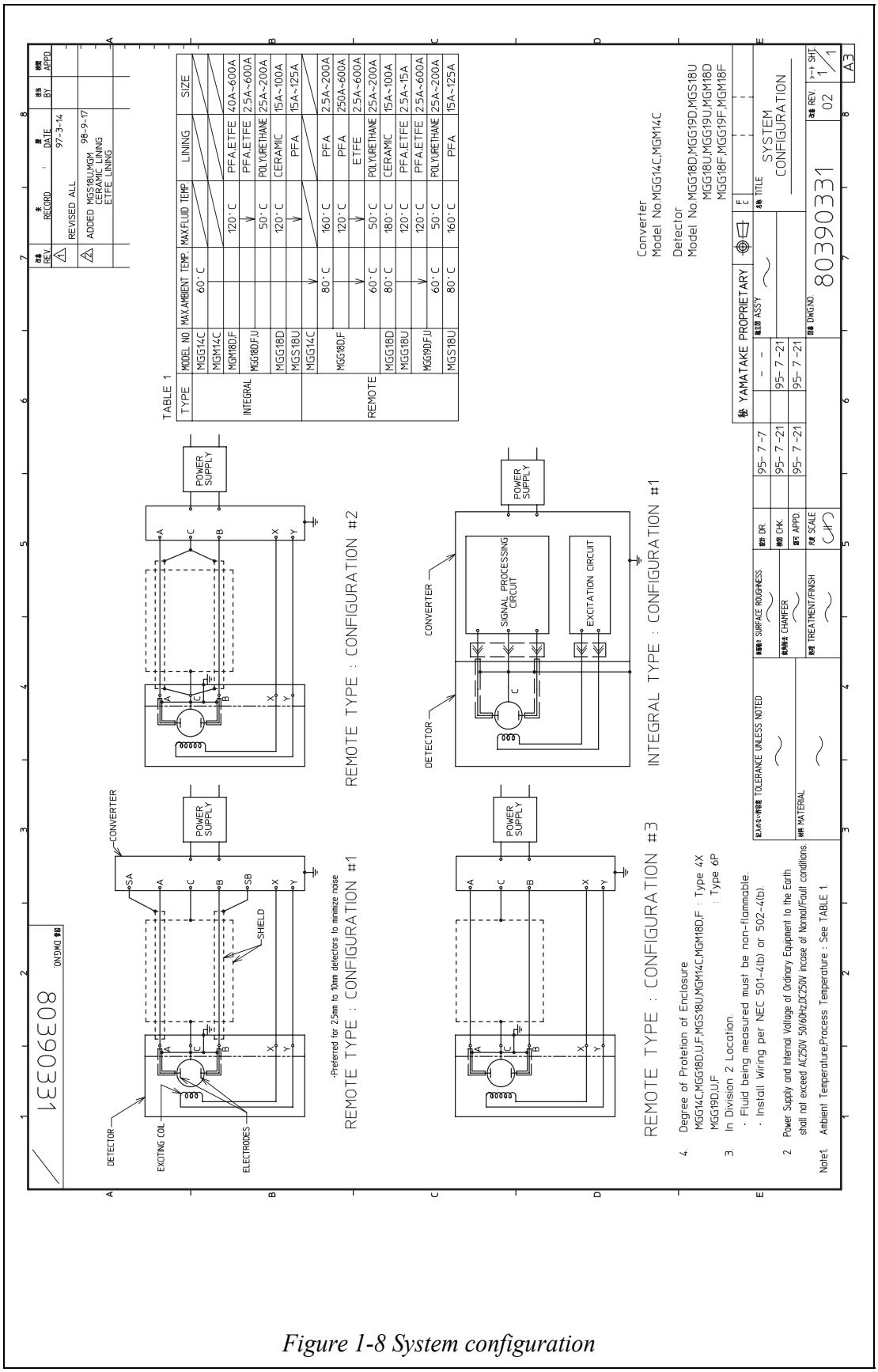


Figure 1-8 System configuration

Chapter 2: Installation

This chapter describes the installation and wiring procedures for the flowmeter.

⚠ WARNING

ELECTRIC SHOCK HAZARD! DO NOT perform wiring work while the power is ON!

Site selection

When selecting an installation site for the flowmeter, observe the following safety measures:

⚠ CAUTION

Install the flowmeter in a location with an ambient temperature of -25 °C to 60 °C (-13 °F to 140 °F) and an ambient humidity of 5 to 100% RH to prevent equipment malfunction or output errors.

⚠ CAUTION

Do not install the flowmeter near high-current power lines, motors or transformers to prevent damage from electromagnetic induction, which can cause equipment malfunction or output errors.

⚠ CAUTION

Be sure to ground the welding power transformer when welding near the flowmeter to avoid output errors.

⚠ CAUTION

DO NOT use the flowmeter to ground a welder. It can damage the flowmeter.

Unpacking and storage

The model MGG10C/MGG14C MagneW3000 FLEX$^+$/PLUS$^+$ Flowmeter is a precision instrument and should be handled with care to prevent damage or breakage.

After unpacking the flowmeter, verify that the following items are included:

- Model MGG10C/MGG14C converter
- Standard accessories
- MagneW setting data sheet
- Test report

If you have questions regarding the technical specifications of the flowmeter, contact your nearest Yamatake Corporation office or Yamatake Corporation representative. When making an inquiry, make sure to provide the model number and product number of your flowmeter.

Storage

When storing the flowmeter before use:

- Store indoors at room temperature (77 °F or 25 °C) within a humidity level of approximately 65%.
- Store away from vibration or shock.
- Store the converter and detector in the original packaging.

In addition, when storing the converter after use:

- Attach the display cover, Terminal box cover and Waterproof gland(s) to prevent moisture ingression into the device.

Installation options

There are three ways to install the flowmeter. Integral systems are pre-assembled with the converter attached to the detector; remote systems allow you to install the converter in a remote location - wall mounted or mounted directly to a two inch (50.8 mm) pipe. The following illustrations provide dimensions for the three different installation options.

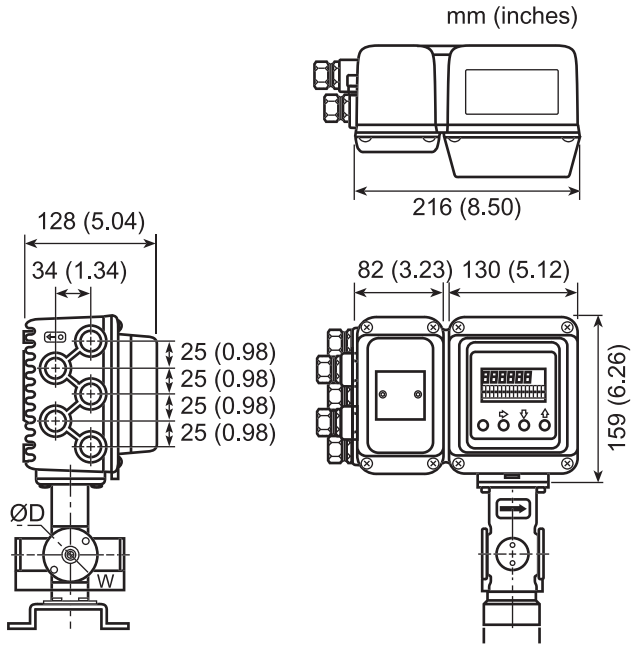


Figure 2-1 Integral installation

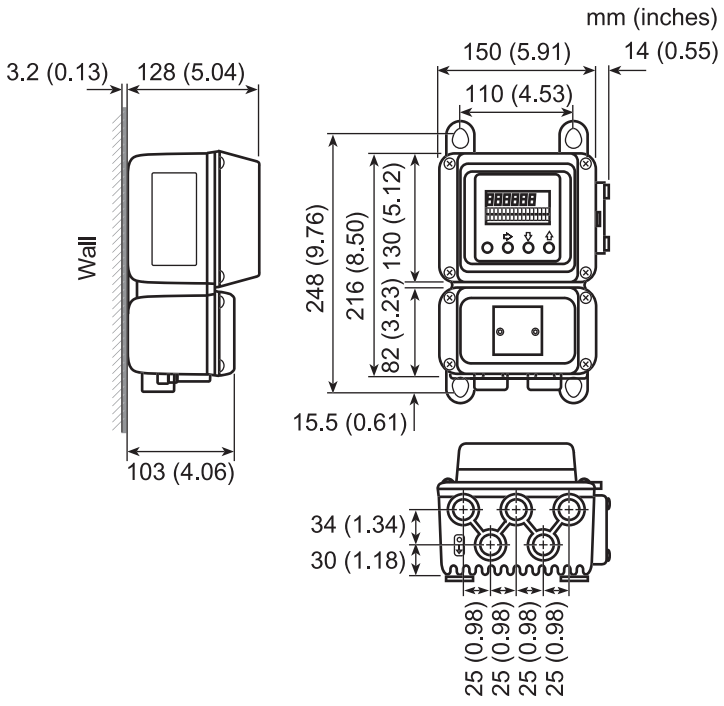


Figure 2-2 Wall mounted remote installation

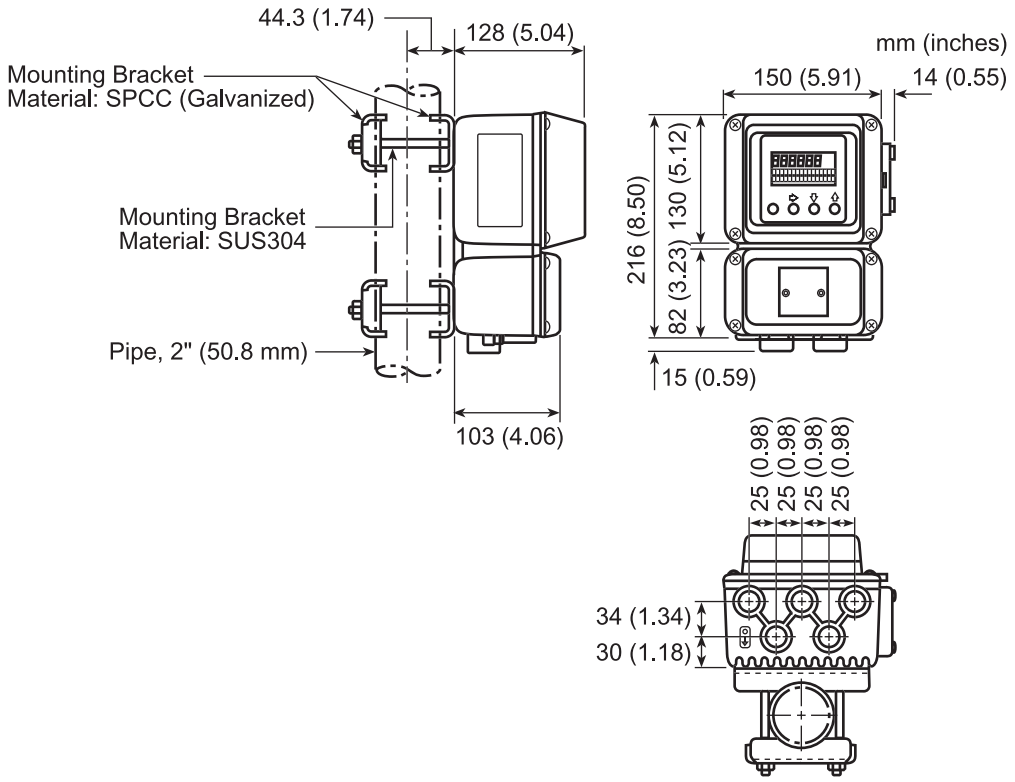


Figure 2-3 Pipe mounted remote installation

Changing the orientation of the converter

The model selected when the flowmeter is purchased determines the orientation of the display. It is possible, however, to change the horizontal or vertical orientation of the converter.

To change the orientation of the converter:

1. Remove the four screws holding the display cover to the main body and remove the cover.
2. Remove the four screws holding the display panel to the main body.
3. Remove and rotate the display panel to the required orientation.
4. Replace the four screws and tighten.
5. Rotate the display cover so that the openings for the LEDs are correctly aligned with the Display Panel.
6. Replace the four screws and tighten.

Wiring

⚠ CAUTION

Use electrical tube and duct to prevent water entry and protect the cable from external damage.

⚠ CAUTION

Be sure to use a waterproof gland at the conduit connection to prevent water entry inside of the terminal box and prevent output errors.

⚠ CAUTION

Turn off the power supply before connecting the cables to the converter. The converter can be damaged. This type of damage is not covered by Yamatake's warranty.

⚠ CAUTION

Be sure to plug all unused conduit connections with a water tight plug.

Integral wiring - 1 (1-contact input and 1- contact output)

To wire a remote system, the following cables are required:

- Analog output cable - see page 2-16
- Pulse output cable - see page 2-17
- Contact input/output cable - see page 2-17

The following pages provide information on selecting the correct cables and wiring the system. A diagram of the terminal block for a remote system is shown below.

1-contact input and 1-contact output

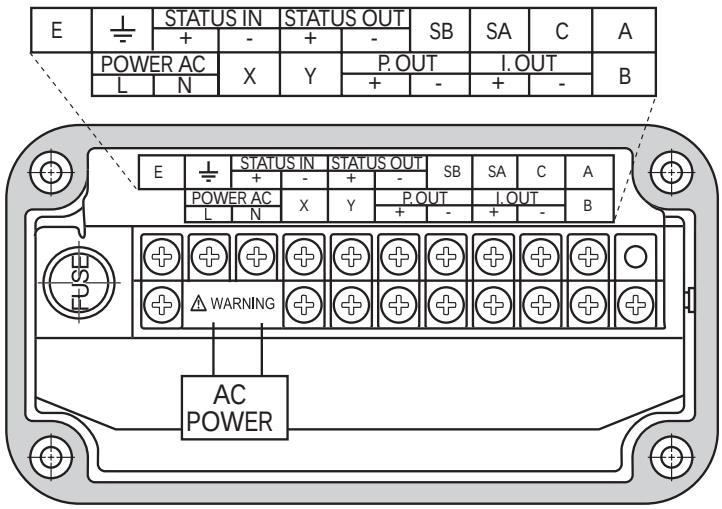


Figure 2-4 Integral converter terminal block

Table 2-1 Remote converter terminal descriptions (1-contact input & 1-contact output)

Symbol		Description
I. OUT	+	Analog output
	–	
P. OUT	+	Pulse output
	–	
STATUS IN	+	Contact input
	–	
STATUS OUT	+	Contact output
	–	
E		Not used
⏚		Grounding (grounding resistance must be <100Ω)

~ Note *In case of DC24V and DC110V power supply, the symbol of the "L" and "N" of the power supply become "+" and "–".*

Integral wiring - 2 (2-contact input)

To wire a remote system, the following cables are required:

- Analog output cable - see page 2-16
- Pulse output cable - see page 2-17
- Contact input/output cable - see page 2-17

The following pages provide information on selecting the correct cables and wiring the system. A diagram of the terminal block for a remote system is shown below.

2-contact input

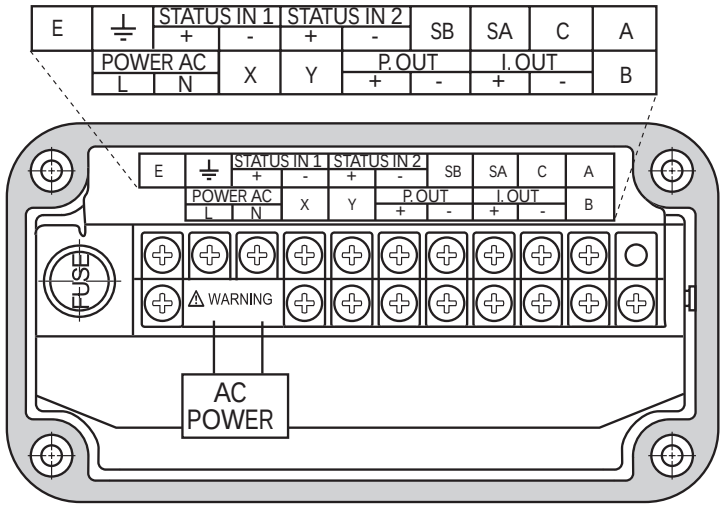


Figure 2-5 Integral converter terminal block

Table 2-2 Remote converter terminal descriptions (2-contact input)

Symbol		Description
I. OUT	+	Analog output
	–	
P. OUT	+	Pulse output
	–	
STATUS IN 1	+	Contact input 1
	–	
STATUS IN 2	+	Contact input 2
	–	
E		Not used
⏚		Grounding (grounding resistance must be < 100 Ω)

~ Note *In case of DC24V and DC110V power supply, the symbol of the "L" and "N" of the power supply become "+" and "–".*

Integral wiring - 3 (2-contact output)

To wire a remote system, the following cables are required:

- Analog output cable - see page 2-16
- Pulse output cable - see page 2-17
- Contact input/output cable - see page 2-17

The following pages provide information on selecting the correct cables and wiring the system. A diagram of the terminal block for a remote system is shown below.

2-contact output

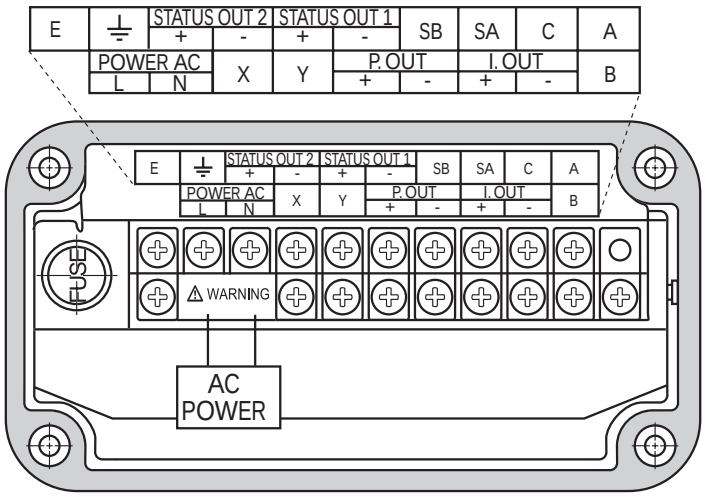


Figure 2-6 Integral converter terminal block

Table 2-3 Remote converter terminal descriptions (2-contact output)

Symbol		Description
I. OUT	+	Analog output
	–	
P. OUT	+	Pulse output
	–	
STATUS OUT 1	+	Contact output 1
	–	
STATUS OUT 2	+	Contact output 2
	–	
E		Not used
⏚		Grounding (grounding resistance must be < 100 Ω)

~ Note *In case of DC24V and DC110V power supply, the symbol of the "L" and "N" of the power supply become "+" and "–".*

Remote wiring - 1 (1-contact input and 1- contact output)

To wire a remote system, the following cables are required:

- Signal cable - see page 2-12
- Excitation cable - see page 2-12
- Analog output cable - see page 2-16
- Pulse output cable - see page 2-17
- Contact input/output cable - see page 2-17

The following pages provide information on selecting the correct cables and wiring the system. A diagram of the terminal block for a remote system is shown below.

1-contact input and 1-contact output

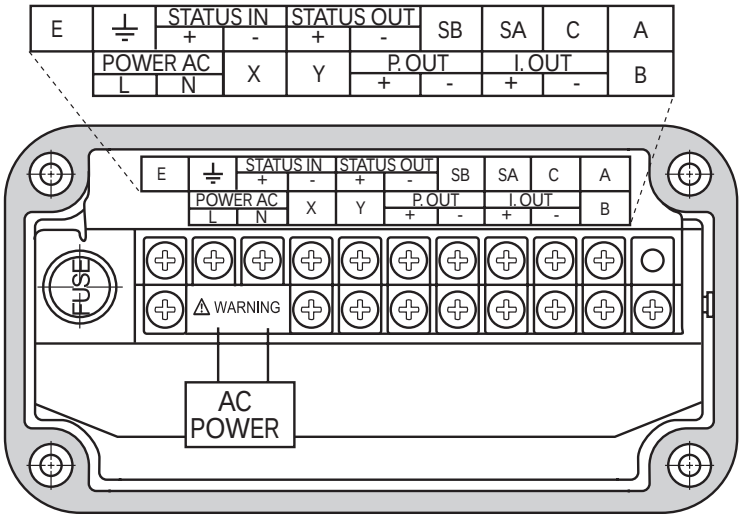


Figure 2-7 Remote converter terminal block

Table 2-4 Remote converter terminal descriptions (1-contact input & 1-contact output)

Symbol		Description
A		Flow rate signal input
B		
C		
SA		
SB		
I. OUT	+	Analog output
	–	
P. OUT	+	Pulse output
	–	
STATUS IN	+	Contact input
	–	
STATUS OUT	+	Contact output
	–	
X		Excitation
Y		
E		Not used
⏚		Grounding (grounding resistance must be <100Ω)

~ Note *In case of DC24V and DC110V power supply, the symbol of the "L" and "N" of the power supply become "+" and "–".*

Remote wiring - 2 (2-contact input)

To wire a remote system, the following cables are required:

- Signal cable - see page 2-12
- Excitation cable - see page 2-12
- Analog output cable - see page 2-16
- Pulse output cable - see page 2-17
- Contact input/output cable - see page 2-17

The following pages provide information on selecting the correct cables and wiring the system. A diagram of the terminal block for a remote system is shown below.

2-contact input

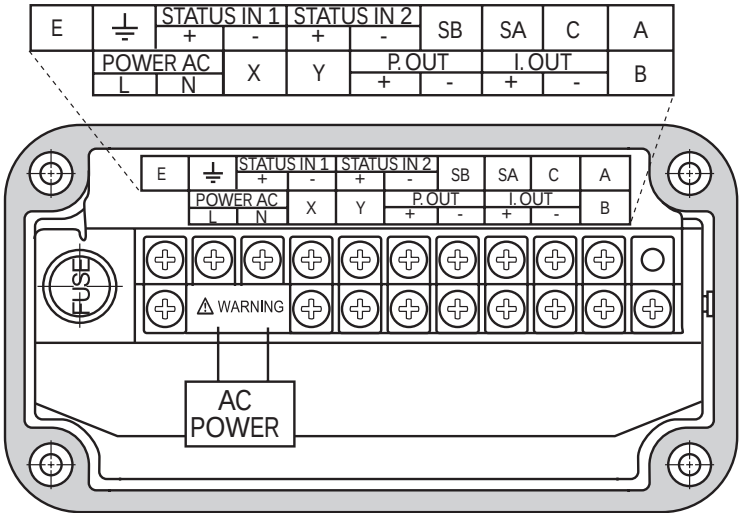


Figure 2-8 Remote converter terminal block

Table 2-5 Remote converter terminal descriptions (2-contact input)

Symbol		Description
A		Flow rate signal input
B		
C		
SA		
SB		
I. OUT	+	Analog output
	–	
P. OUT	+	Pulse output
	–	
STATUS IN 1	+	Contact input 1
	–	
STATUS IN 2	+	Contact input 2
	–	
X		Excitation
Y		
E		Not used
⏚		Grounding (grounding resistance must be < 100 Ω)

~ Note *In case of DC24V and DC110V power supply, the symbol of the "L" and "N" of the power supply become "+" and "–".*

Remote wiring - 3 (2-contact output)

To wire a remote system, the following cables are required:

- Signal cable - see page 2-12
- Excitation cable - see page 2-12
- Analog output cable - see page 2-16
- Pulse output cable - see page 2-17
- Contact input/output cable - see page 2-17

The following pages provide information on selecting the correct cables and wiring the system. A diagram of the terminal block for a remote system is shown below.

2-contact output

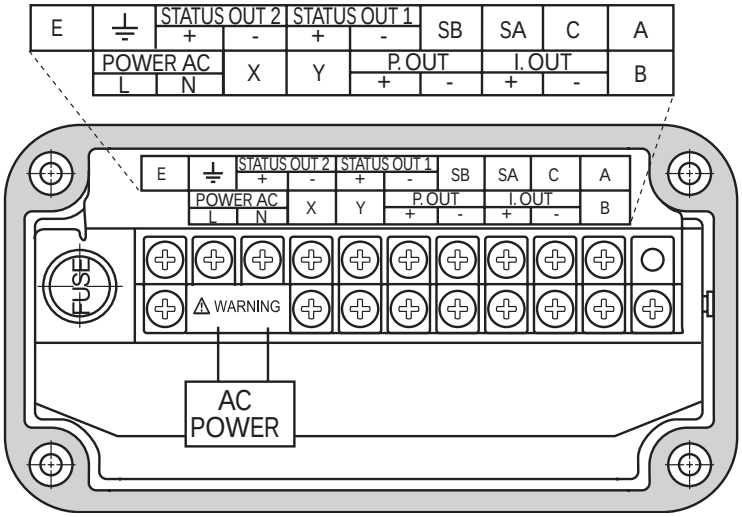


Figure 2-9 Remote converter terminal block

Table 2-6 Remote converter terminal descriptions (2-contact output)

Symbol		Description
A		Flow rate signal input
B		
C		
SA		
SB		
I. OUT	+	Analog output
	–	
P. OUT	+	Pulse output
	–	
STATUS OUT 1	+	Contact output 1
	–	
STATUS OUT 2	+	Contact output 2
	–	
X		Excitation
Y		
E		Not used
⏚		Grounding (grounding resistance must be < 100 Ω)

~ Note *In case of DC24V and DC110V power supply, the symbol of the "L" and "N" of the power supply become "+" and "–".*

Grounding

⚠ CAUTION

ELECTRIC SHOCK HAZARD! Grounding is essential for accurate measurement. The grounding resistance must be less than 100Ω.

Signal and excitation cable specifications

For remote installations, the converter and detector are connected using a set of dedicated cables (Model MGA12W). The signal cable connects the output signal of the detector to the converter and the excitation cable feeds the excitation current to the detector. You can obtain these cables from Yamatake or purchase commercially available cables. Integral flowmeters already contain the converter to detector connections.

The cables between the detector and converter should be no longer than 300 m (984 ft.), but the actual length depends on conductivity of the fluid being measured.

The following cable diameters apply:

Signal cable - 11.4 mm (0.45 in.), 0.75 mm^2 (.0011625 sq. in.) or equivalent commercially available cable (CVVS or CEEV, for example)

Excitation cable - 10.5 mm (0.41 in.), 2 mm^2 (.0031 sq. in.) or equivalent commercially available cable (CVV, for example)

Cable dimensions and construction are shown on the following pages.

The following graphs show the ratio of fluid conductivity to cable length and show cable usage ranges for different diameter cables. The acceptable usage range for Yamatake cable Model MGA12W cables encompass both areas A and B in the graphs below while commercially available cables are limited to area A only.

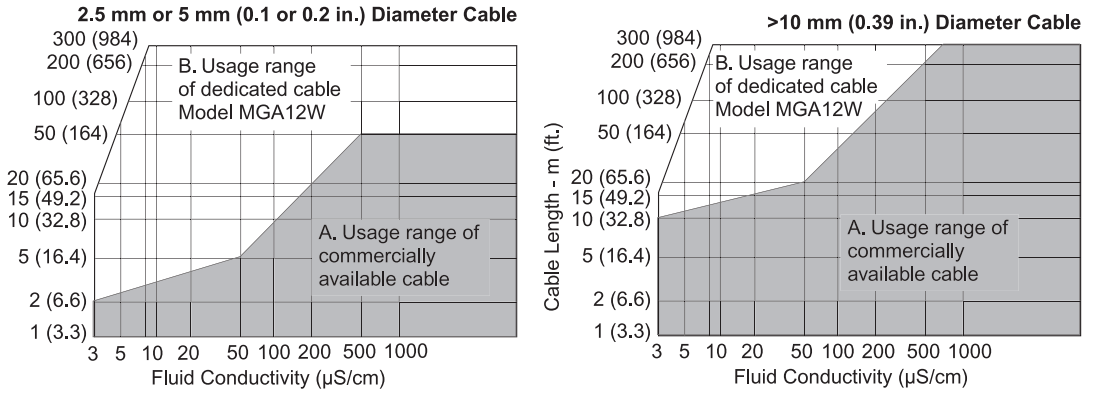


Figure 2-10 Cable usage ranges

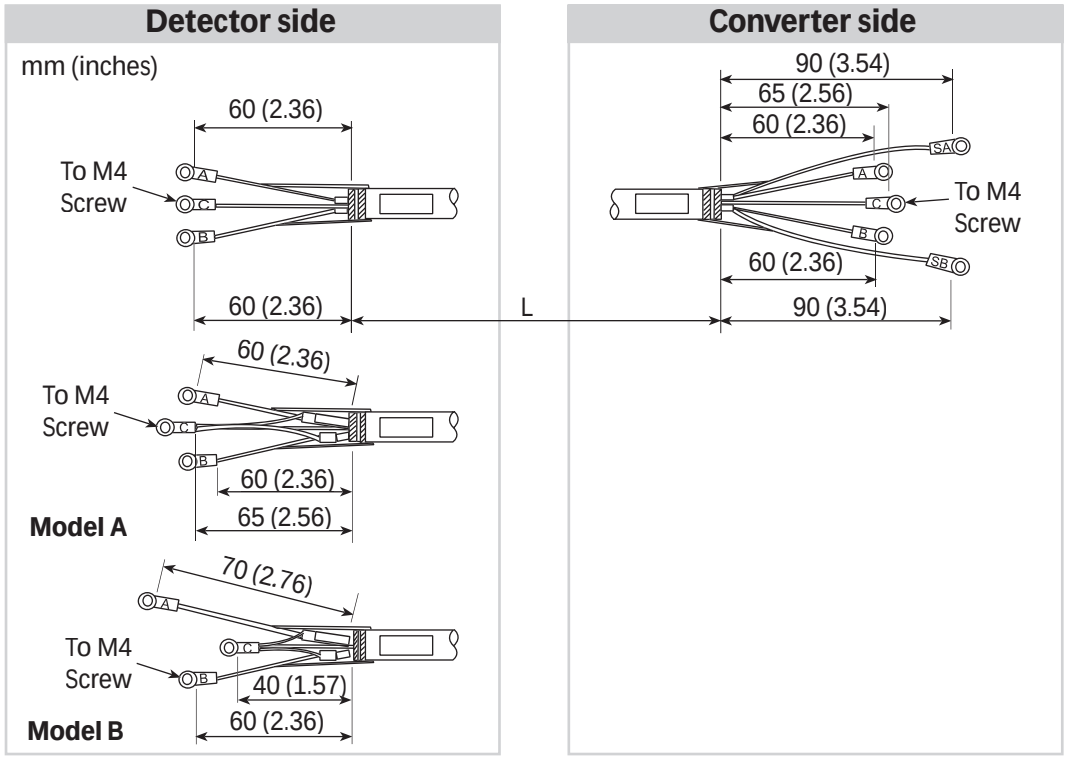


Figure 2-11 Signal Cable Dimensions

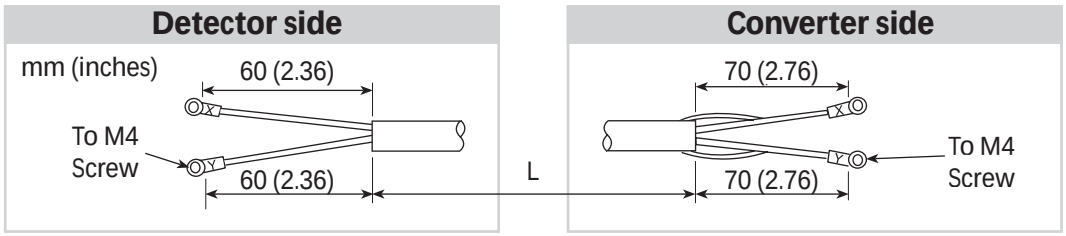


Figure 2-12 Excitation Cable Dimensions

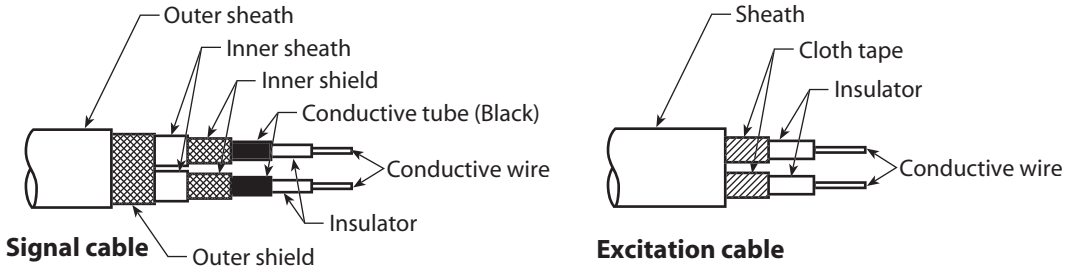


Figure 2-13 Signal and excitation cable construction

~ Note *Strip the conductive tubing (black) down to the ends of the inner shields on the conductive wires for terminals A and B of the signal cable.*

Signal and excitation cable wiring

The following figure shows the proper terminal connections for the signal and excitation cables for both model MGA12W cables and commercial cable.

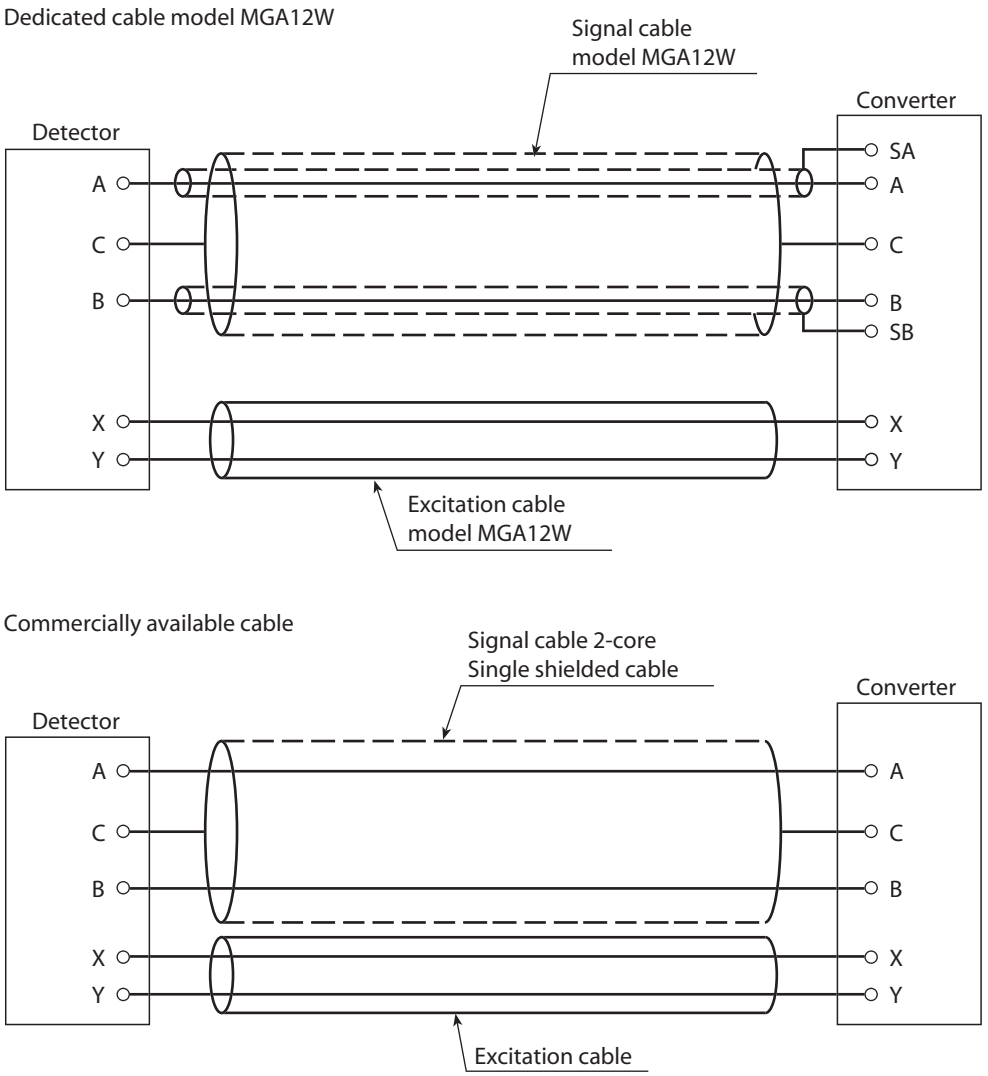


Figure 2-14 Detector to converter wiring diagram

Wiring cable

Selecting the cable

The recommended wiring cable is a 600V vinyl sheath electrical wire CVV (JIS C 3401) with a conductor section of 2 mm^2(0.0031 $inch^2$), or a twisted cable with an equivalent or higher capacity.

Shielded wire is recommended for wiring at locations subject to electromagnetic noise interference.

Select a sheath material suitable for the cable installation environment (consider ambient temperature, corrosive gas, corrosive fluid, etc.)

Run the cable into the terminal block through the conduit connection (G1/2 internal thread, CM20 external thread, Pg13.5 or 1/2NPT internal thread).

An outer diameter of ϕ11(0.433 inch) is optimum. (The applicable range of cable outer diameters is ϕ10(0.394 inch) - ϕ12(0.4724 inch).)

A crimp terminal (M4 screw) with an insulation sleeve is recommended for the terminal connections.

The maximum length of the wiring cable is 1500 m(4921 ft). However, the maximum length between converter and detector is 300 m(984 ft).

Wiring the cable

When wiring the cable between this product and the control equipment, the following precautions must be observed.

~ Note

- *Run the wiring away from equipment that may generate noise, such as high-capacity transformers, motors, or power supplies. DO NOT install the cable in the same tray or duct as other power cables. Output errors may result.*
- *For water proofing and damage prevention of the wire, we recommend cabling work using conduits and ducts. Use a water proof cable gland.*

Wiring

Analog output wiring

The current output wiring method depends on HART or SFC communication.
An external power supply is required to communicate with the SFC.
(Change dip switch settings only after turing power supply OFF.)

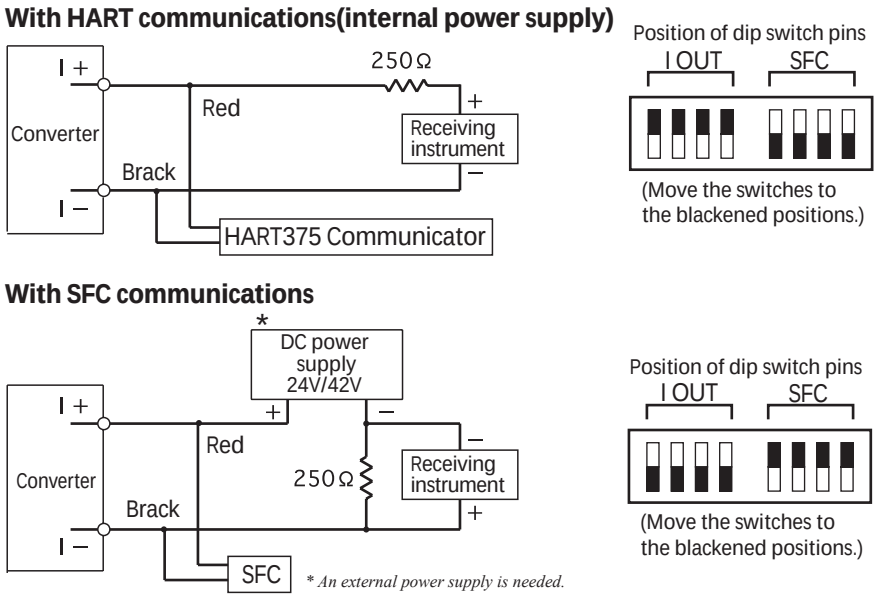


Figure 2-15 Wiring diagram for current output

~ Note

- *Check and confirm that the polarity of the wiring is correct. Incorrect polarity may cause damage to the equipment.*
- *In case of not using communication function, the position of dip switch pins should be set as the HART communication. HART Communication works with the wiring for the SFC communication.*
- *The communication type (HART or SFC) must be specified when ordering. In case of communication change, the following two configurations are necessary.*

1) According to the communication type, switch position should be changed. (Refer to the Figure 2-15).
2) Change communication type in the “COM SELECT” screen in the “Shipping Info” screen.

Pulse output wiring

The pulse output is an open collector output.

Pay close attention to voltage and polarity when wiring.

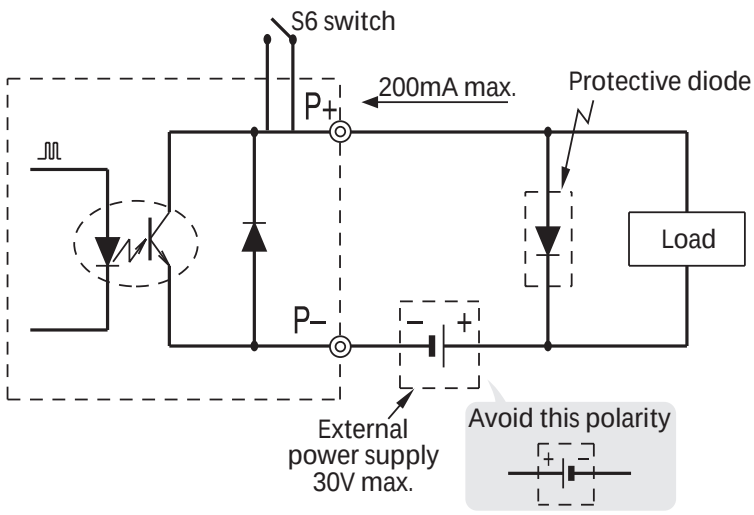


Figure 2-16 Wiring diagram for pulse output

~ Note *Check and confirm that the polarity of the wiring is correct. Incorrect polarity may cause damage to the equipment.Use an external power supply that meets the voltage and capacity specifications. Pulse may be output when the power is turned ON or OFF. Pulse output protection circuit causes voltage drop. Some counters may not pick up the pulses due to this voltage drop. In such case, turn On S6 switch. Refer to the Figure 2-17.*

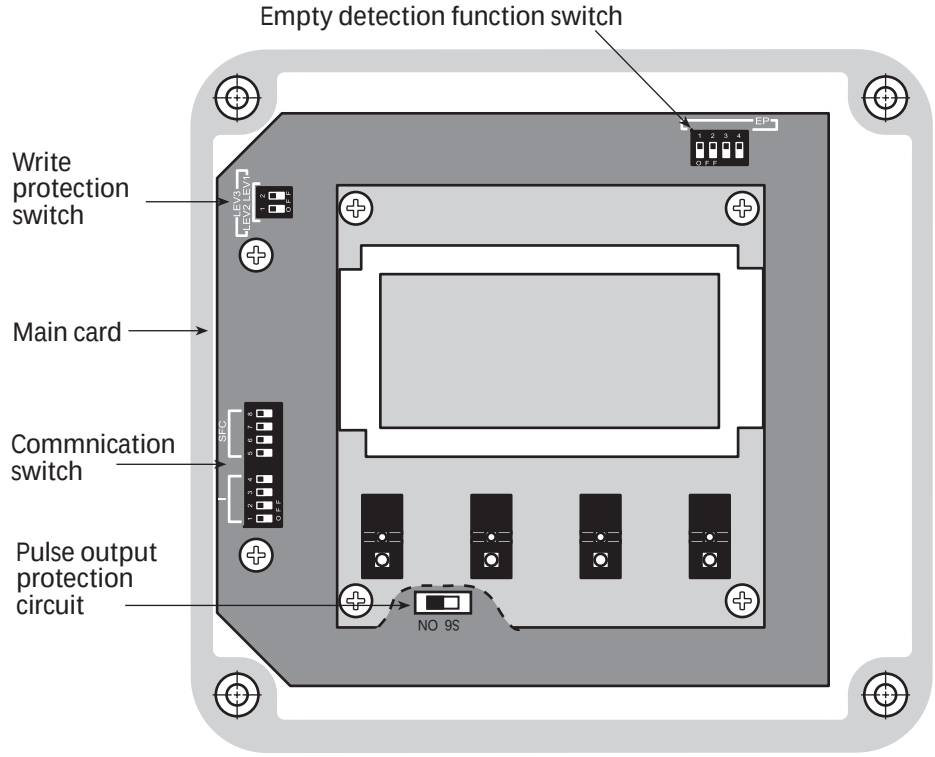


Figure 2-17 Switch locations on main card

Contact input wiring

Either a semi conductive contact or a no-voltage contact can be used as the contact input.

The contact input terminals are not available when a 2-contact output model has been selected.

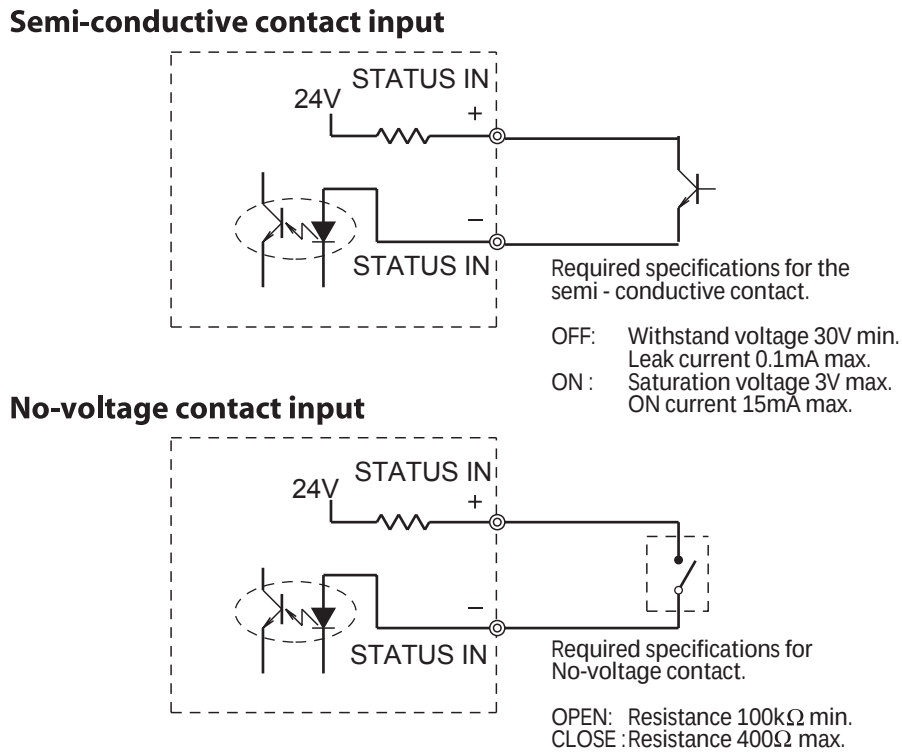


Figure 2-18 Wiring diagram for contact input

Contact output wiring

Pay close attention to voltage and polarity when wiring for an open collector output.

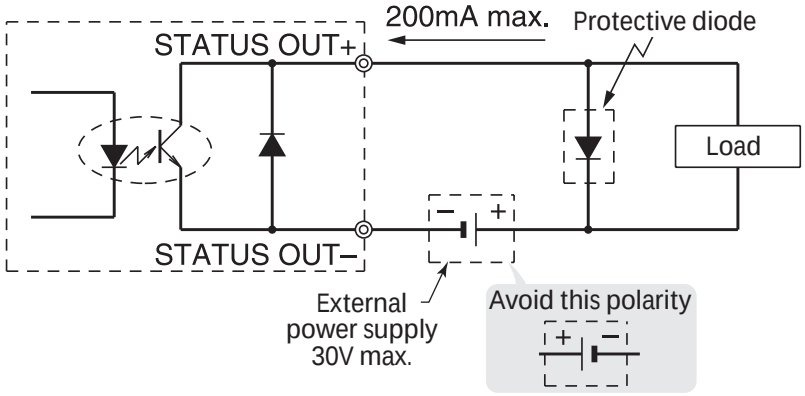


Figure 2-19 Wiring diagram for contact output

~ Note *Check and confirm that the polarity of the wiring is correct. Incorrect polarity may cause damage to the equipment.*
Use an external power supply that meets the voltage and capacity specifications.

Setting write protection

Write protection settings allow you to control the level at which data confirmation and manipulation are possible. The system has four modes:

Basic setup mode - used to run the flowmeter on a day-to-day basis.

Engineering mode - used by those who are responsible for flowmeter configuration.

Maintenance mode - used when system maintenance is required.

Advanced mode - used to apply some specific noise immunity functions, and other advanced functions.

Write protection settings are changed by setting the switch positions of the write protection switch on the main card in the converter. When the flowmeter is shipped, settings can be made in any mode (Level 0). The following table shows the write protect levels available by resetting the switch:

Table 2-7 Write Protection Levels

Level	Basic setup/ Engineering mode	Advanced mode	Maintenance mode	Remarks
0	✔	✔	✔	Default setting
1	✔	✔	✕	
2	✔	–	✕	
3	–	–	✕	

✔ *- Both data confirmation and manipulation are possible.*

– *- Only data confirmation is possible.*

✕ *- Neither data confirmation nor manipulation are possible.*

To set the write protection level:

1. Remove the four screws holding the display cover to the main body of the converter and remove the cover.
2. Locate the write protection switch.

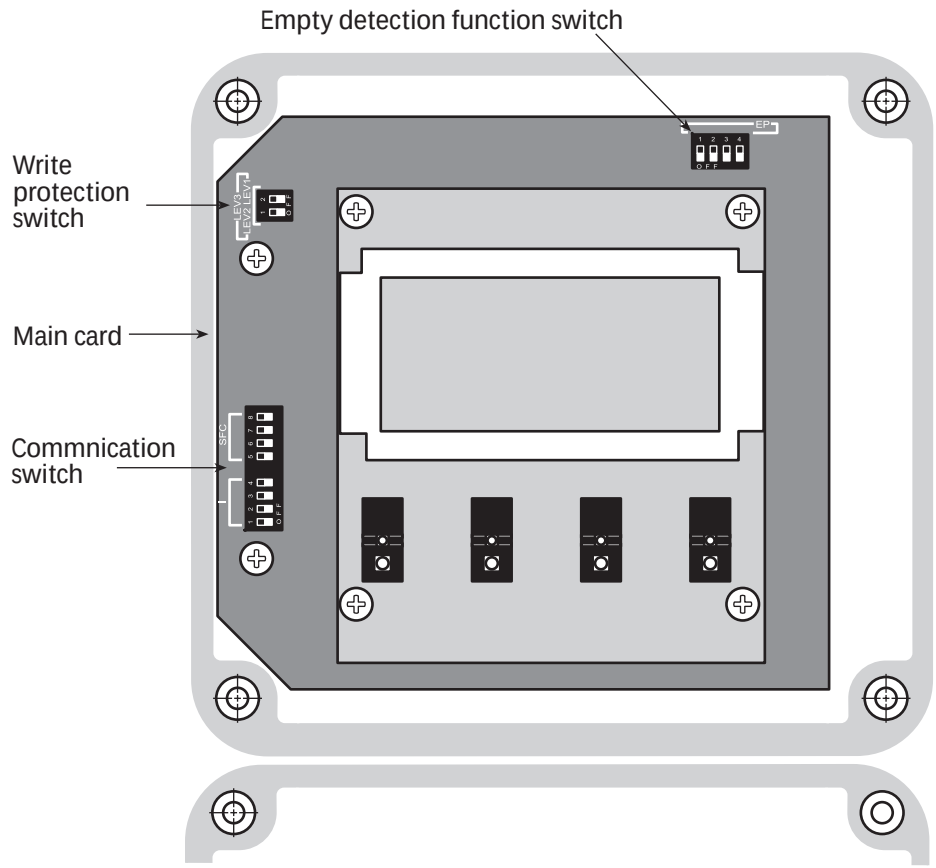
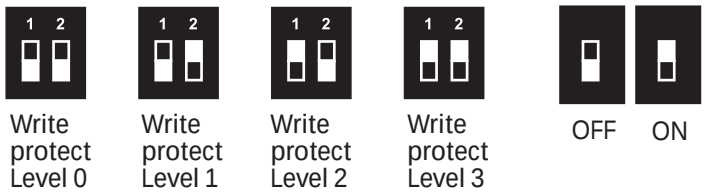


Figure 2-20 Switch locations on main card

3. Set the write protection switch positions to the required level of protection.



(Move the switches to the white positions)

Figure 2-21 Write protection switch positions

Setting the communication via the HART

To check the communication switch position on the main card:

1. Remove the four screws holding the display cover to the main body of the converter and remove the cover.
2. Locate the communication switch

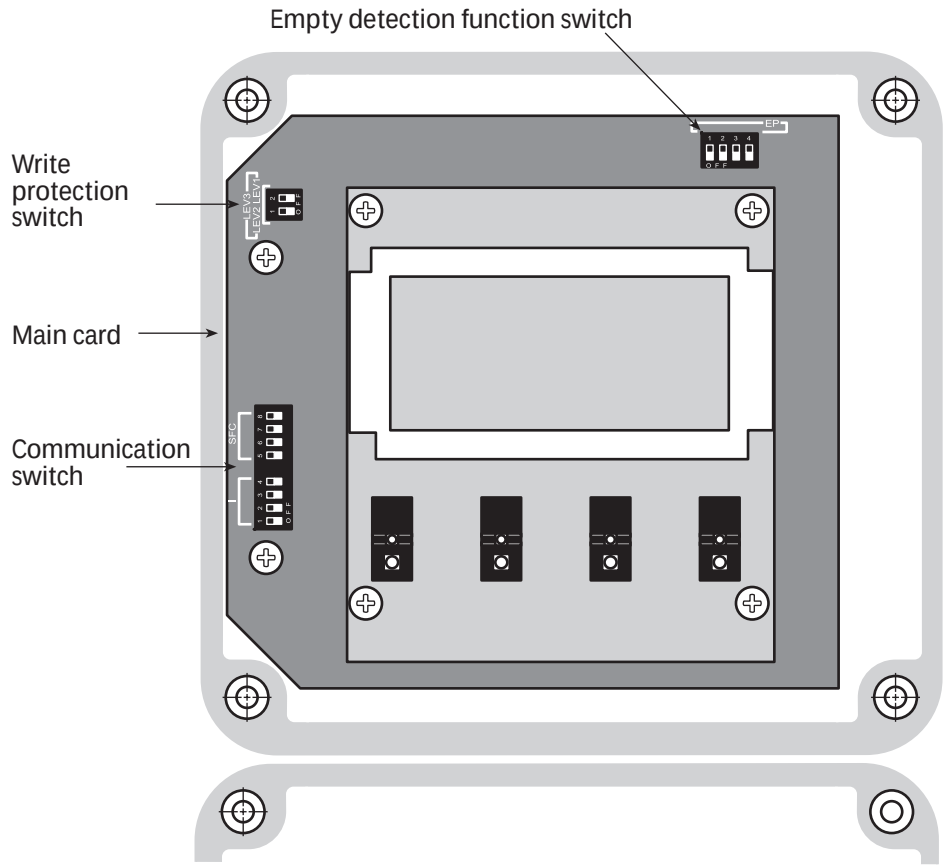
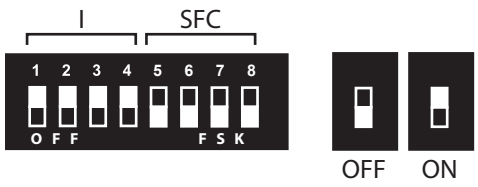


Figure 2-22 Switch locations on main card

3. Make sure that position of the I switch (1-4) are ON and positions of the SFC switch (5-8) are OFF.



(Move the switches to the white positions)

Figure 2-23 HART communication switch positions

~ Note *Refer to the Figure 2-15 Wiring diagram for current output for the wiring*

Setting the empty detection function

This function fixes the analog output and latches the display to zero when the detector is empty.

To set the empty detection function:

1. Remove the four screws holding the display cover to the main body of the converter and remove the cover.
2. Locate the empty detection function switch.

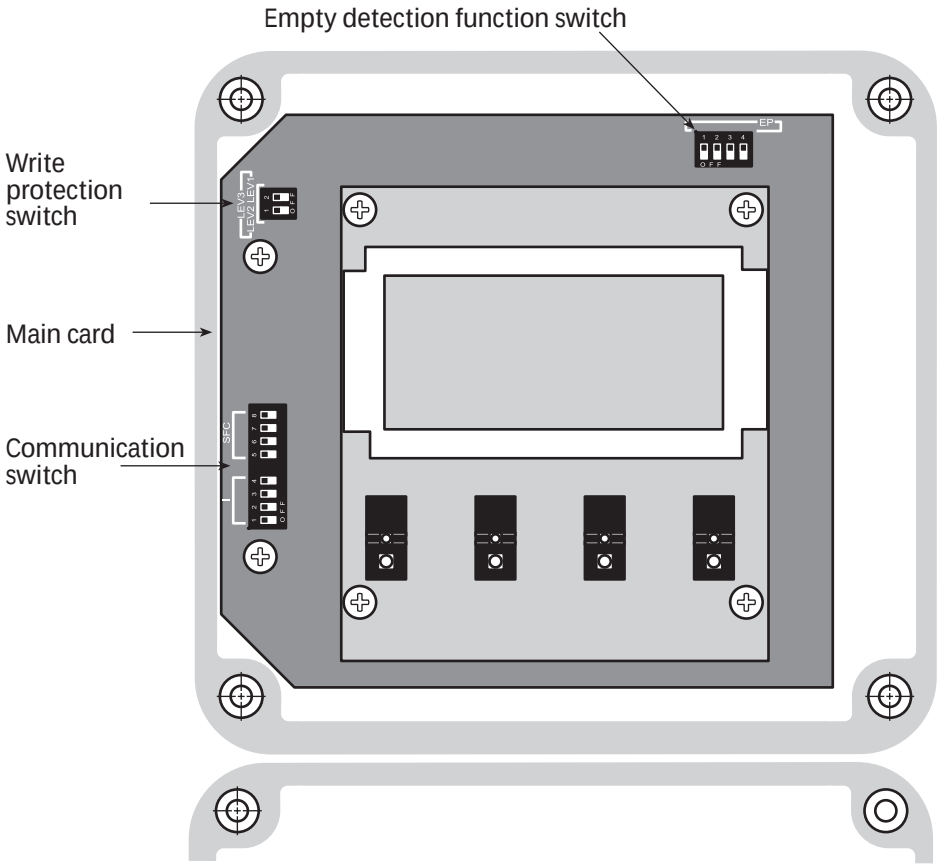
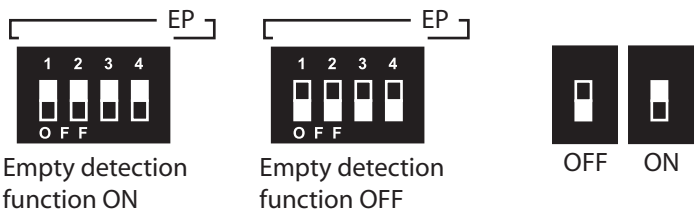


Figure 2-24 Switch locations on main card

3. Set the empty detection function switch positions to the required setting.



(Move the switches to the white positions)

Figure 2-25 Empty detection function switch positions

Setting the communication via the SFC

To check the communication switch position on the main card:

1. Remove the four screws holding the display cover to the main body of the converter and remove the cover.
2. Locate the communication switch

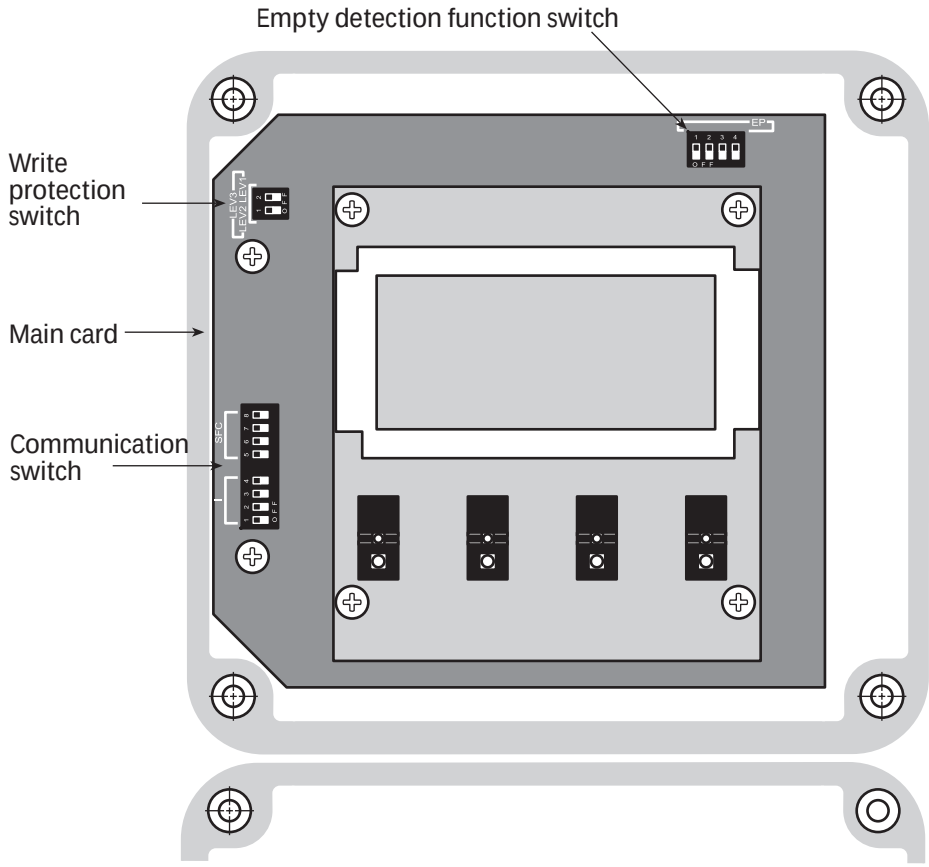


Figure 2-26 Switch locations on main card

3. Make sure that position of the I switch (1-4) are OFF and positions of the SFC switch (5-8) are ON.

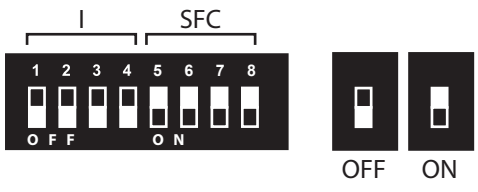


Figure 2-27 SFC communication switch positions

Connecting power

⚠ WARNING

ELECTRIC SHOCK HAZARD! DO NOT perform wiring work while the power is ON!

Commercial power (AC100~120, 200~240V, 50-60Hz) or a 24 VDC ± 10% power supply is required for this system. The power supply specification is shown on the name plate of your converter.

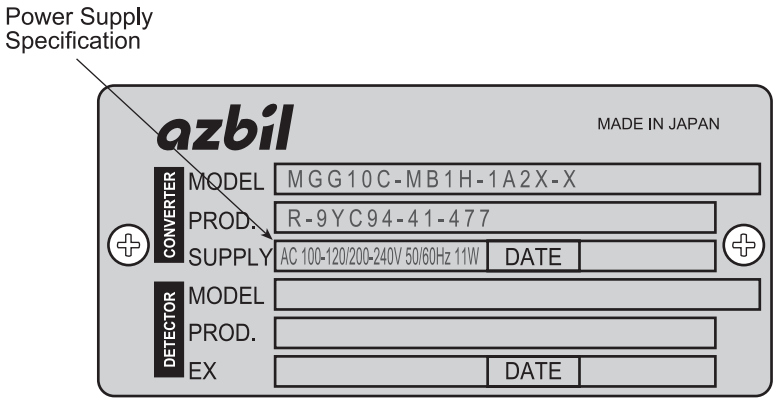


Figure 2-28 Name plate

The 24 VDC converter has a terminal marked “POWER DC24V” instead of “POWER,” as on the remote converter.

Chapter 3: Operation

This chapter describes the procedure for starting and shutting down the flowmeter and using the display panel and the infrared touch sensor keys.

Start-up

To start operation of the flowmeter:

1. Confirm that the detector is correctly installed on the pipe.
2. Confirm that the wiring between the converter and the detector has been properly completed according to the installation instructions specified in this manual. In case of using a HART/SFC communication function, verify an appropriate wiring according to the wiring in this users manual.
3. Begin and then stop fluid flow through the detector so that fluid is present in the detector in a static condition.
4. Confirm that there is no leakage at the flanges of the detector.
5. Apply power to the converter.
6. The following display appears seven seconds after the power is ON.:

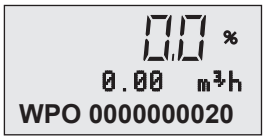


Figure 3-1 Start-up display

7. Zero the flowmeter using the procedure on page 4-14.

   The flowmeter is now on and operational.

Shut down

⚠ CAUTION

Switch the control equipment to manual control before terminating flowmeter operation and shutting off the output to the control equipment. This action prevents the power shut-off from directly affecting the control equipment and causing the valve positioner to malfunction.

To stop operation of the flowmeter:

1. Switch the control equipment connected to the flowmeter to manual control.
2. Turn off power to the converter.

Using the display panel

The display panel is shown below, followed by a description of each feature. The infrared touch sensor keys are described in the next section.

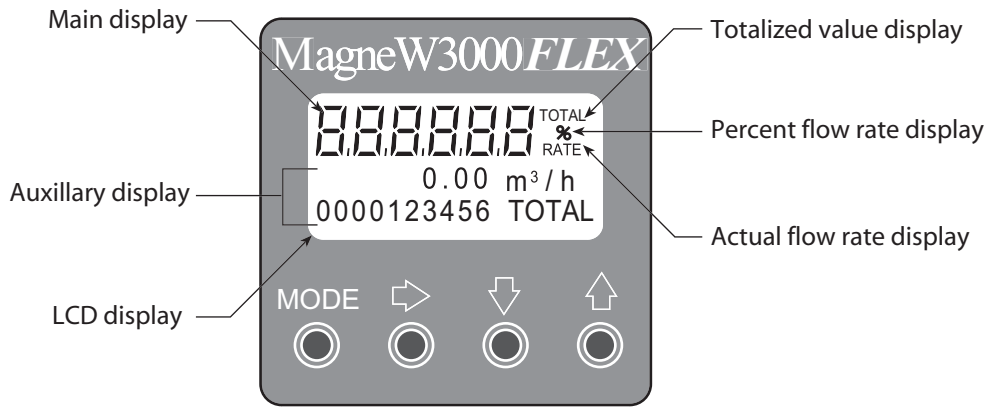


Figure 3-2 Display panel

Main display

- Indicates the flow rate selected in basic setup mode.

Auxiliary display

- Several values are displayed in this area:

- During measurement mode, indicates a flow rate to supplement the flow rate selected in the basic setup mode.
- Indicates the totalized value
- When not in measurement mode, indicates the procedures for parameter setting, adjustment, etc.

Percent flow display

- When lit, indicates that the percent flow rate is currently being displayed on Main display.

Actual flow rate display

- When lit, indicates that the actual flow rate is currently being displayed on Main display.

Totalized value display

- When lit, indicates that the totalized value is currently being displayed on Main display.

Using the infrared touch sensor keys

The infrared touch sensor keys allow you to make selections by simply touching the display panel.

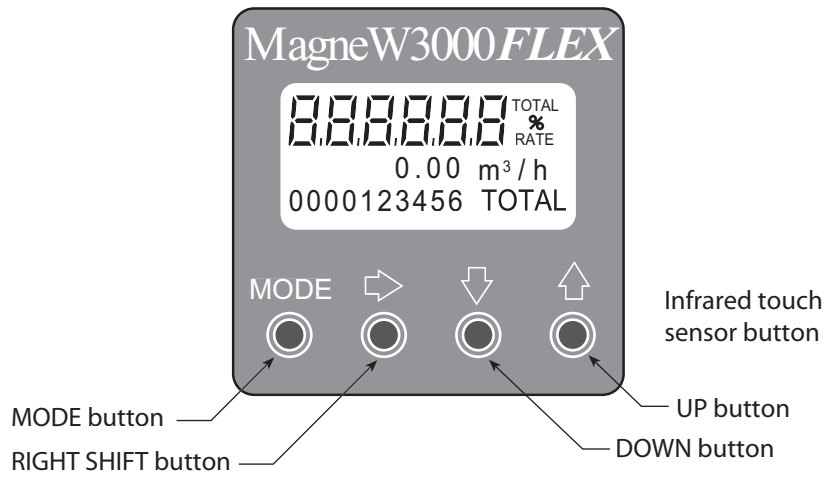


Figure 3-3 Touch sensor keys

For best results, approach the key from below and completely cover the circle. Then move your finger straight down to its original position. These motions ensure correct operation. Moving sideways across the keys can accidently activate the wrong control.

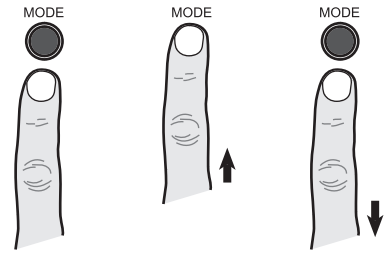


Figure 3-4 Using the touch sensor keys

The following table is a summary of the functions of each of the keys.

Table 3-1 Touch Sensor key Functions

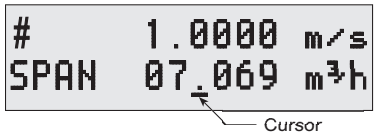
key	Function
MODE key MODE	Touching and holding this key for more than three seconds opens Basic setup MODE. Writes data into memory after changing the parameters or internal data in engineering mode, maintenance mode or advanced mode.
RIGHT SHIFT key	Shifts the cursor in the display to the right.
DOWN key	When the cursor is on the Mode Indicator as shown below, touching the DOWN key displays the next screen.  When the cursor is located at a number, touching the DOWN key decrements the number.  When the cursor is located at the decimal point, touching the DOWN key moves the decimal point to the right. 

Table 3-1 Touch Sensor key Functions

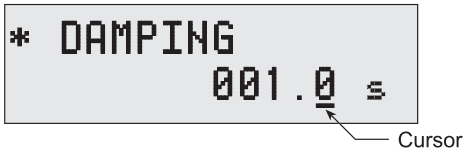
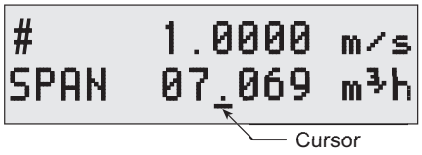
key	Function
UP key 	When the cursor is on the Mode Indicator as shown below, touching the UP key displays the next screen.  When the cursor is located at a number, touching the UP key increments the number.  When the cursor is located at the decimal point, touching the UP key moves the decimal point to the left.  When the cursor is located at READY, touching the UP key starts operation. 

Table 3-2 Default settings

Parameter	Default	Parameter	Default
TAG	XXXXXXXX	HI-ALM	+115%
DAMPING	3.0s	LO-ALM	-115%
SPAN	as specified	FALL SAFE MODE	LOW
DISPLAY SELECT	as specified	ST. OUT MODE	CLOSE
HYSTERESIS	0	AVERAGING	OFF
GRAVITY	1.0000	COEFFICIENT	1.0000
PLS SCL (PULSE SCALE)	as specified or 1.0000 l/p	DROP OUT	2%
PLS WID (PULSE WIDTH)	DUTY 50	LOW FLOW CUT	OFF

Chapter 4: Using the display panel

This chapter describes the four modes of operation and how to use each one. A flow chart of the functions for each mode is also included.

About modes

The MagneW3000 FLEX$^+$/PLUS$^+$ Flowmeter has five modes of operation:

- MEASURING MODE
- BASIC SETUP MODE
- ENGINEERING MODE
- MAINTENANCE MODE
- ADVANCED MODE

The following table describes the functions available in each mode.

Table 4-1 Mode functions

Mode	Description
MEASURING MODE	This is the normal operational mode and indicates the measuring status. Each time the MEASURING MODE is selected, data is written into memory. Settings entered in other modes are held in temporary memory for two minutes, but will return to the previously saved value unless the MEASURING MODE is selected to save the data. The only exception is the counter, which is always saved into memory immediately.
BASIC SETUP MODE Mode indicator: ✱	This mode is used to change data settings that must be recorded or changed frequently. These settings include: TAG NO. Damping time constant Display select Auto zero Flow rate range Detector data Built -in counter reset/preset
ENGINEERING MODE Mode indicator: #	This mode is used to change data settings that are used less frequently. These settings include: Function setting Flow rate range Pulse data Fail safe mode setting
MAINTENANCE MODE Mode indicator: ›	This mode is used when adjustment or verification is required for regular maintenance of the system or when troubleshooting the system. This mode includes: Shipping information Output adjustment Gain adjustment This mode is further divided into the following two modes: OUTPUT CHECK MODE CALIBRATION MODE

Table 4-1 Mode functions

Mode	Description
ADVANCED MODE Mode indicator: &	This mode is used to apply some specific noise immunity functions. This mode includes: Damping Manual zero Averaging Auto spike Cut Coefficient Drop out Low-flow cut off Flow direction change

⚠ CAUTION

The CALIBRATION MODE and ADVANCED MODE contain adjustments and operations that are very important for proper flow rate measurement. Improper settings in these modes will prevent measurement.

MEASURING MODE

This is the normal operational mode. In this mode, the screen indicates the measuring status. What is displayed on screen depends upon the setting selections made in the other modes.

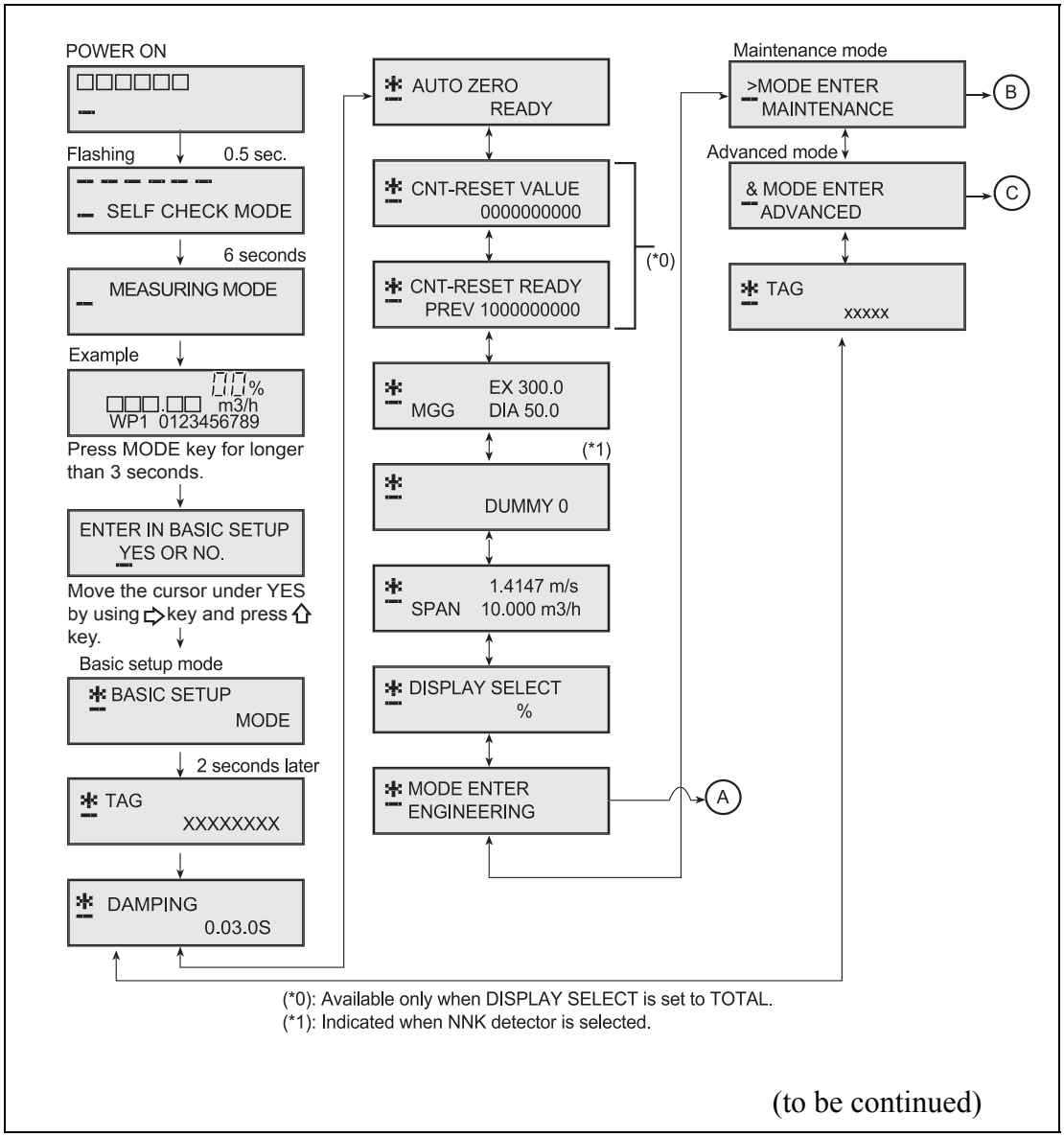
This mode performs one other important function. Entering this mode causes the system to save settings entered in other modes. Each time the MEASURING MODE is selected, data is written into memory. Settings entered in other modes are held in temporary memory for two minutes, but will return to the previously saved value unless the MEASURING MODE is selected. The only exception is the counter, which is always saved into memory immediately.

⚠ CAUTION

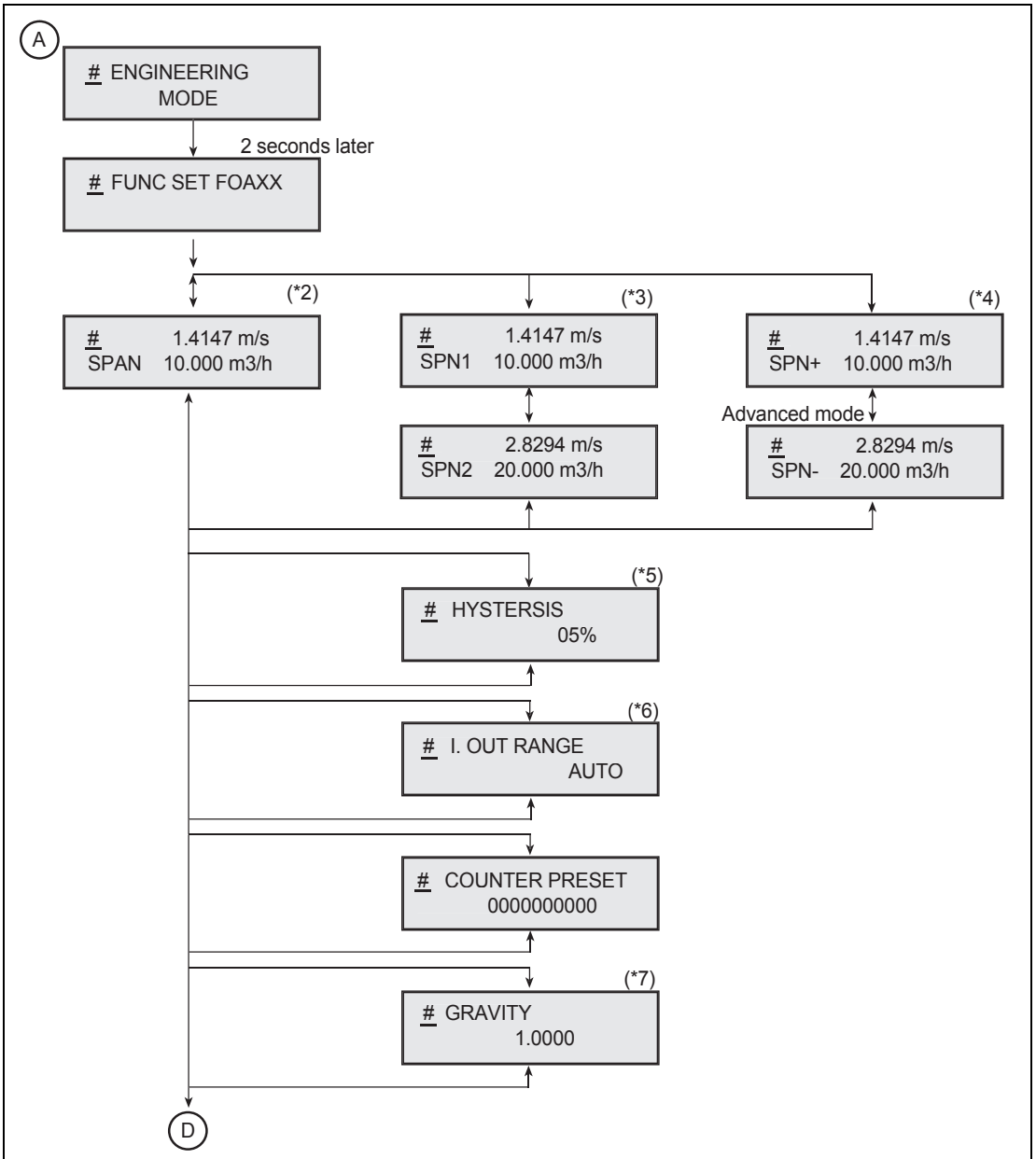
After entering settings in other modes, ALWAYS immediately select the MEASURING MODE to save settings.

LCD display flow

The following screens appear in this order.

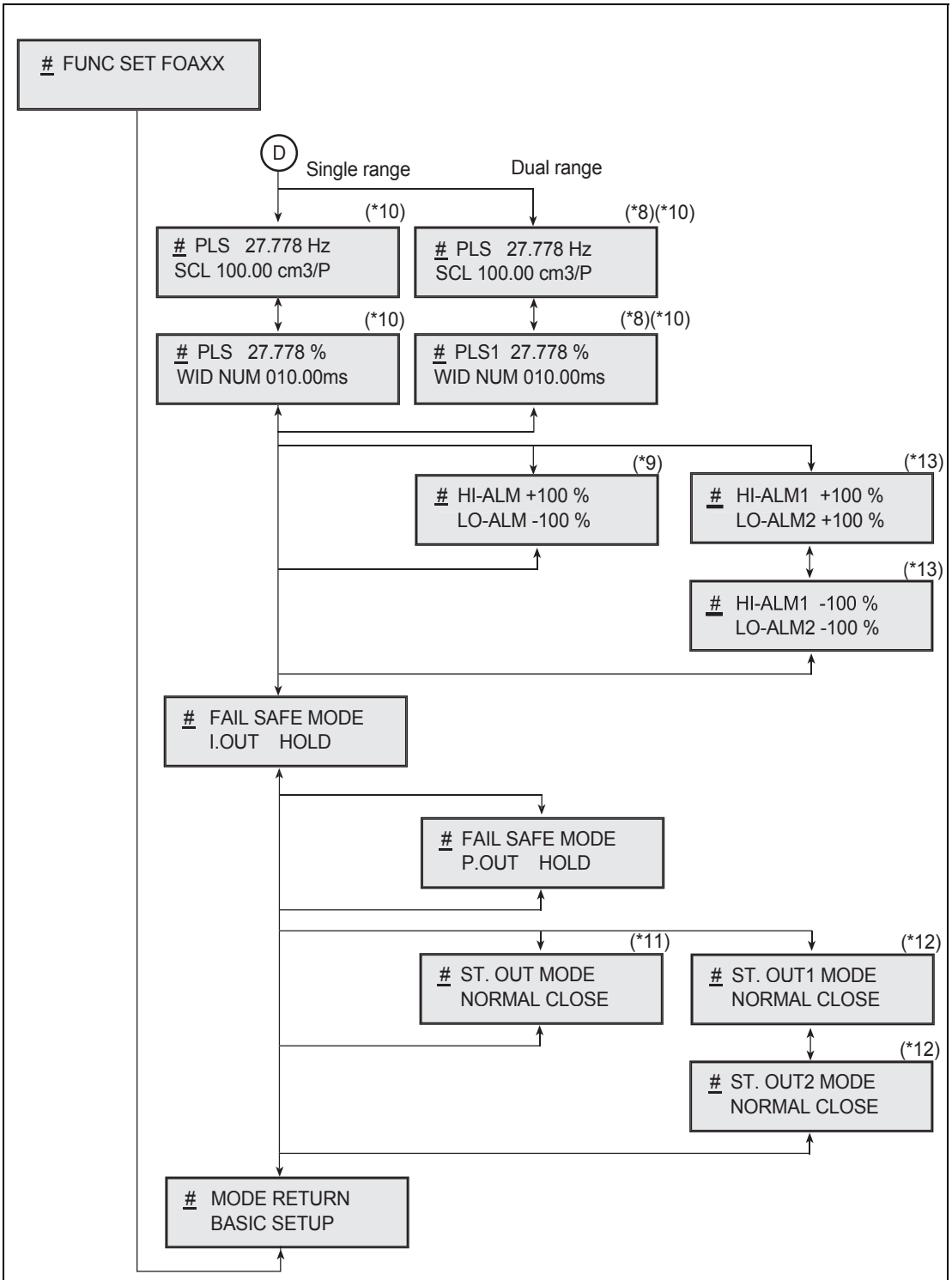


(to be continued)



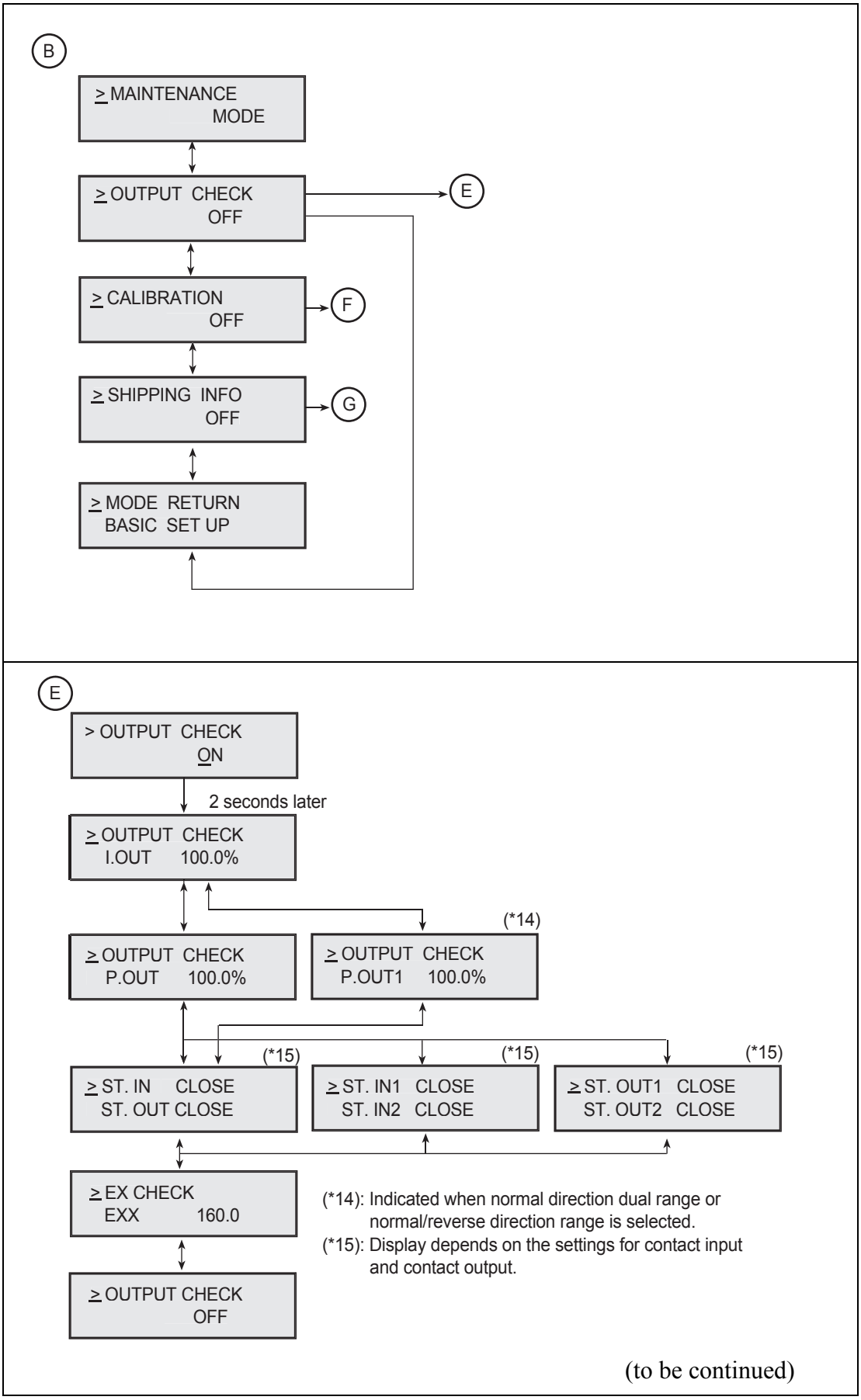
(*2): Indicated when single range is selected.
(*3): Indicated when normal direction automatic dual range or normal direction external switching range is selected.
(*4): Indicated when normal/reverse automatic range or normal/reverse external swiching range is selected.
(*5): Indicated when automatic range is selected in (*3) and (*4).
(*6): Indicated when normal direction dual range is selected.
(*7): Indicated when a mass unit is selected.

(to be continued)

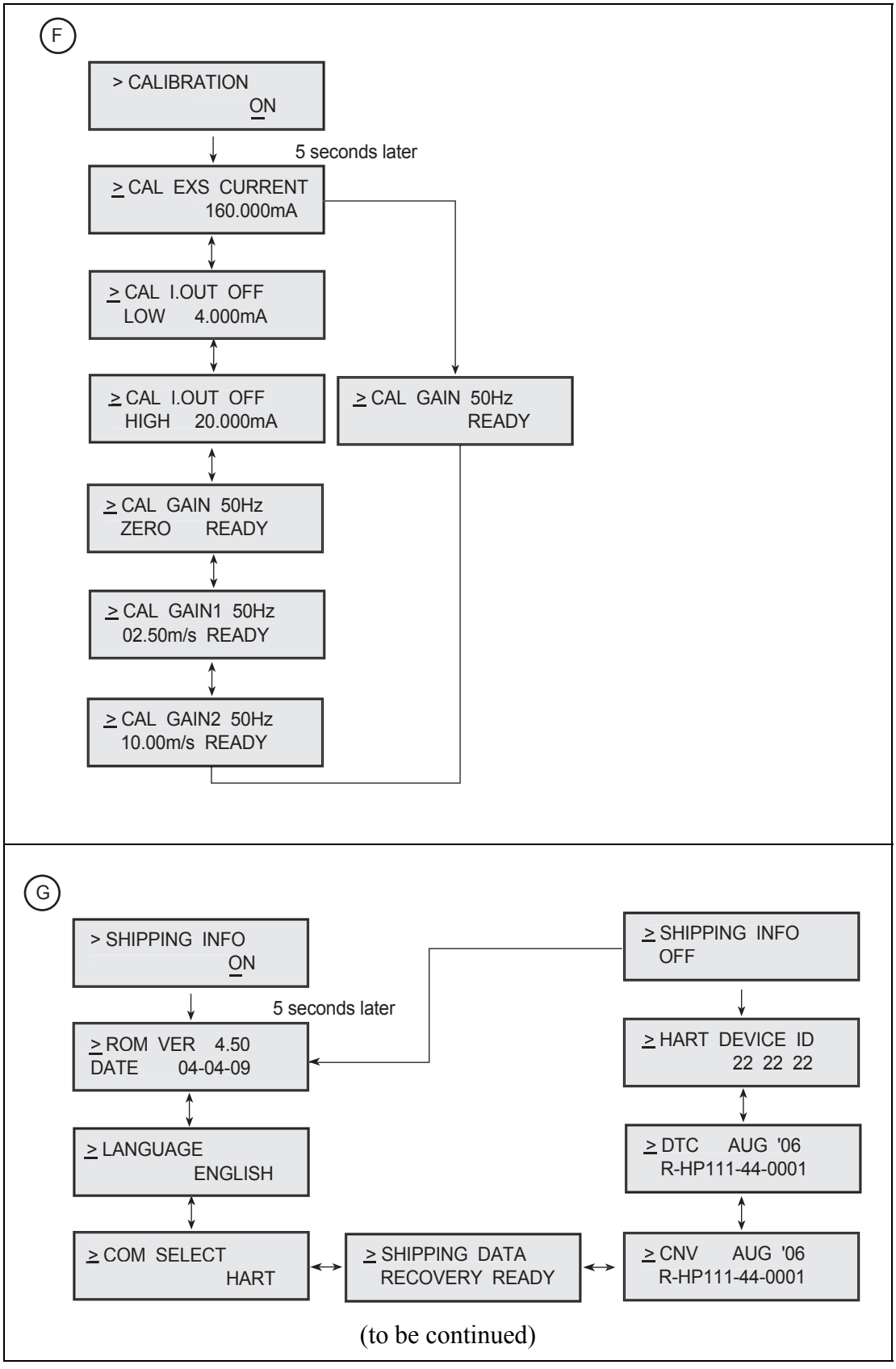


(*8) : Indicated when normal direction dual range or normal/reverse direction range is selected.
(*9) : Indicated when high/low limit alarms are set for the contact output in function setting.
(*10): May indicate "DUTY50%" instead of "NUM".
(*11): Indicated when 1-contact output/1-contact input is reqistered in function setting.
(*12): Indicated when 2-contact output is used.
(*13): Indicated when single range H1-L1/H2-L2 is selected in function setting.

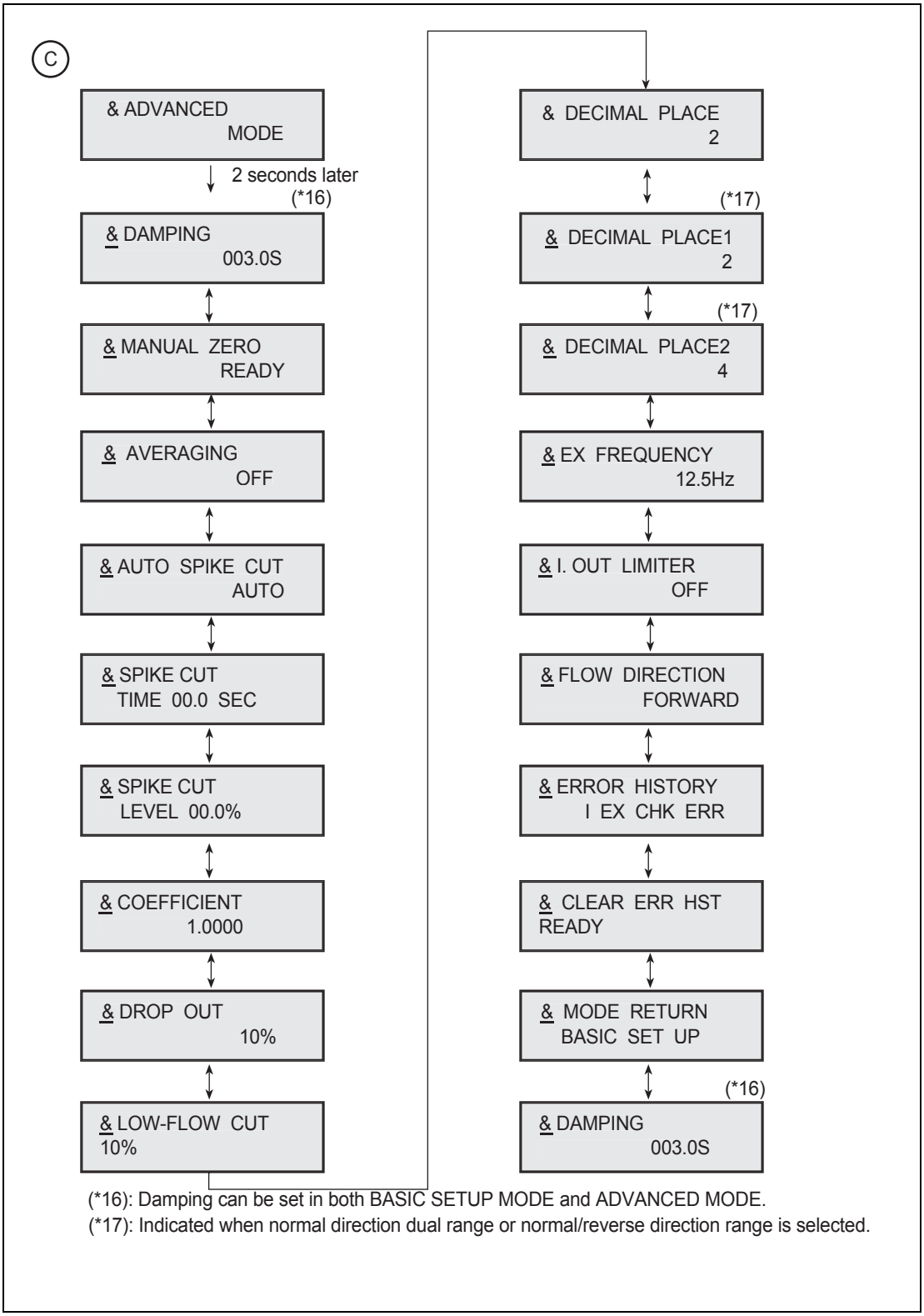
(to be continued)



(to be continued)



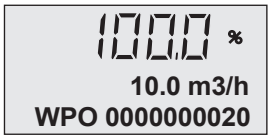
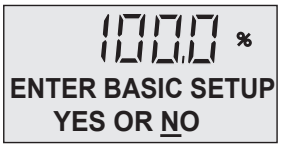
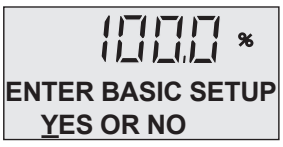
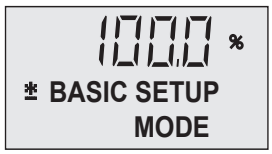
(to be continued)



(*16): Damping can be set in both BASIC SETUP MODE and ADVANCED MODE.
(*17): Indicated when normal direction dual range or normal/reverse direction range is selected.

Entering BASIC SETUP MODE

The following screens appear in this order in BASIC SETUP MODE.

Step	Screen (English)	Screen (Japanese)	Procedure
1			Left display is an example of MEASURING MODE. Touch MODE key and hold for three seconds. The BASIC SETUP MODE ENTER screen appears.
2	 ↓ 	 ↓ 	Make sure to operate the following within 8 seconds. If no operation is done in 8 seconds, the screen automatically returns to the MEASURING MODE. 1) In case of entering BASIC SETUP MODE Touch the ⇨ key twice to move the cursor to YES. Touch the ⇧ key once. 2) In case of back to MEASURING MODE Touch the ⇨ key three times to move the cursor to NO. Touch the ⇧ key once.
3			With the operation of 1), the BASIC SETUP MODE screen appears for two seconds.
4			TAG setting screen appears two seconds after.

Setting the TAG NO.

This function sets the TAG NO. of the flowmeter.

Default setting

XXXXXXXX

Setting range

8 characters max. Alphanumeric characters, -, @, and space can be set.

Step	Screen (English)	Screen (Japanese)	Procedure
1	0.0 % ENTER BASIC SETUP YES OR NO	0.0 % セッテイヲハジメマスカ？ YES OR NO	Enter the BASIC SETUP MODE. (See page 4-11)
2	0.0 % ± TAG XXXXXXXX	0.0 % ± タグナンバ XXXXXXXX	In the BASIC SETUP MODE, the TAG NO. screen is the first screen that appears.
3	12.3 % ± TAG XXXXXXXX	12.3 % ± タグナンバ XXXXXXXX	Touch the ⇨ key until the cursor is at the character to be changed.
4	12.3 % ± TAG FXXXXXXX	12.3 % ± タグナンバ FXXXXXXX	Touch ⇧ or ⇩ key to change the character.
5	12.3 % ± TAG FIC-0001	12.3 % ± タグナンバ FIC-0001	Touch the ⇨ key until the cursor is back at the mode indicator.

Damping time constant

The damping time constant removes minute fluctuations when transmitting the measured flow rate to the control equipment. Check the amplitude of fluctuation in flow output and set the damping time constant to an appropriate value. The new value becomes effective as soon as it is entered

Default setting

3.0 second.

Setting range

0.1 to 199.9 seconds. (0.0 to 199.9 seconds for “Fast Response Option for Short Run Batch Precess”.)

Step	Screen (English)	Screen (Japanese)	Procedure
1	0.0 % ENTER BASIC SETUP YES OR NO	0.0 % セッテイヲハジメマスカ？ YES OR NO	Enter the BASIC SETUP MODE. (See page 4-11)
2	0.0 % & DAMPING 003.0s	0.0 % & ダンピング 003.0S	Use the Touch ⇧ or ⇩ key to cycle through the screens until the damping screen appears.
3	0.0 % & DAMPING 003.0s	0.0 % & ダンピング 003.0S	Touch the ⇨ key until the cursor is at the value to be changed. (in the example, the key is touched three times.)
4	0.0 % & DAMPING 010.0s	0.0 % & ダンピング 010.0S	Use ⇧ or ⇩ key to change the numeric value. Touch and holding either key quickly increments or decrements the values.
5	0.0 % & DAMPING 010.0s	0.0 % & ダンピング 010.0S	Touch the ⇨ key until the cursor is back at the mode indicator. Touch the MODE key and hold for three seconds to return to MEASUREMENT MODE to save the Damping Time Value.

Auto zero

This function adjusts the flowmeter so that the measured flow rate is zero when the fluid is in static condition inside the detector.

⚠ CAUTION

Before operating the flowmeter for the first time, be sure to carry out auto zero. Zero adjustment is very important for accurate flow measurement.

⚠ CAUTION

Before performing auto zero calibration of the flowmeter, make sure the detector is properly grounded (grounding resistance must be less than 100 Ω), that the detector is filled with the fluid to be measured and that the fluid is in static condition. Zero adjustment is possible with a flow speed of 0.2 m/s (0.656 ft./s) or less, but the flow speed should be 0.0 m/s (0.0 ft./s) for accurate adjustment. Output errors can result from improper zeroing.
If the conditions above can not be guaranteed the auto zero function should be ignored.

Step	Screen (English)	Screen (Japanese)	Procedure
1	0.0 % ENTER BASIC SETUP YES OR NO	0.0 % セッテイヲハジメマスカ？ YES OR NO	Enter the BASIC SETUP MODE. (See page 4-11)
2	0.0 % * AUTO ZERO READY	0.0 % * ゼロセッテイ READY	Use the ⇩ or ⇧ key to cycle through the screens until the AUTO ZERO screen appears.
3	0.0 % * AUTO ZERO READY	0.0 % * ゼロチョウセイ READY	Touch the ⇨ key once to move the cursor to READY to indicate that the system is ready for zeroing.
4	0.0 % * AUTO ZERO ON	0.0 % * ゼロチョウセイ ON	Touch the ⇧ key once to select READY and start the auto zero adjustment. The large numerical display flashes and READY changes to ON during adjustment. When the zero adjustment is complete, the flashing stops and ON changes back to READY. Zero adjustment takes approximately 60 to 100 seconds.

Step	Screen (English)	Screen (Japanese)	Procedure
5			Touch the ⇨ key until the cursor is back at the mode indicator. Touch the MODE key and hold for three seconds to return to MEASUREMENT MODE to save the zero setting.

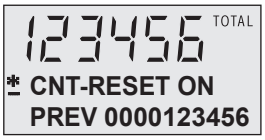
Flow counter - Reset value

This function sets the totalization starting value of the built-in flow counter

Step	Screen (English)	Screen (Japanese)	Procedure
1	123456 TOTAL * CNT-RESET VALUE 0000010000	123456 TOTAL * カウントリセットチ 0000010000	To change this function, the DISPLAY SELECT must be set to TOTAL (see page 4-22). Enter BASIC SETUP MODE (see page 4-11). Use the ⇩ or ⇧ key to cycle through the screens until the CNT-RESET VALUE screen appears.
2	123456 TOTAL *CNT-RESET VALUE 0000010000	123456 TOTAL * カウントリセットチ 0000010000	Touch the ⇨ key as many times as is necessary to move the cursor to the value to be changed. (In the example, the key is touched six times.)
3	123456 TOTAL *CNT-RESET VALUE 0000050000	123456 TOTAL * カウントリセットチ 0000050000	Touch the ⇩ or ⇧ key to change the numerical value. Touching and holding either key quickly increments or decrements the values.
4	123456 TOTAL * CNT-RESET VALUE 0000050000	123456 TOTAL * カウントリセットチ 0000050000	Touch the ⇨ key until the cursor is back at the mode indicator.Touch the MODE key and hold for three seconds to return to MEASUREMENT MODE to save the new value.

Flow counter - Resetting

This function resets the current totalized value and saves it to memory. (The default value for the counter is 000000000 at power-up.)

Step	Screen (English)	Screen (Japanese)	Procedure
1			Enter BASIC SETUP MODE (see page 4-11). (The first screen in this mode is always the TAG screen.) Use the ⇩ or ⇧ key to cycle through the screens until the CNT-RESET screen appears.
2			Touch the ⇨ key once to move the cursor to READY.
3			Touch the ⇧ key to select READY and reset the counter. READY changes to ON as the counter resets and then changes back to READY when it's done.
4			Touch the ⇨ key until the cursor is back at the mode indicator.Touch the MODE key and hold for three seconds to return to MEASUREMENT MODE to save the new value.

Detector data

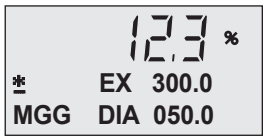
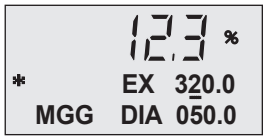
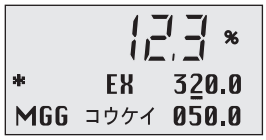
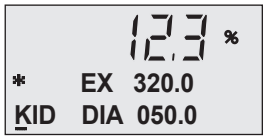
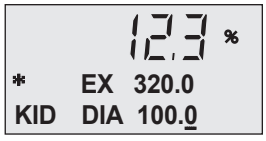
This function is used to select the constant, model and diameter of the detector being used with this converter. In this screen, three values can be changed: the detector constant (EX), detector type (MGG, KID, NNK, NNM) and the detector diameter (DIA)

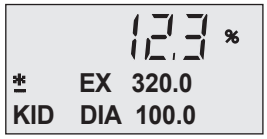
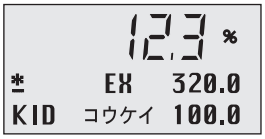
Default setting

If only converter is purchased, the default values are EX 300.0, MGG, DIA050.0.

⚠ CAUTION

If the converter and detector are purchased together, the converter contains the detector data that was set during actual flow calibration. DO NOT change this data or the flowmeter output will be incorrect.

Step	Screen (English)	Screen (Japanese)	Procedure
1			Enter BASIC SETUP MODE (see page 4-11). Use the ⇧ or ⇩ key to cycle through the screens until the detector DATA (EX/DIA) screen appears.
2			Touch the ⇨ key until the cursor is at the detector Constant (EX) to be changed. Touch the ⇧ or ⇩ key to change the value.
3			Touch the ⇨ key until the cursor is at the detector type. Use the ⇧ or ⇩ key to change the value.
4			Use the ⇨ key to move the cursor to the detector Diameter value. The converter works with the following detector Diameters (in millimeters): • 2.5 • 5 • 10 • 15 • 25 • 40 • 50 • 65 • 80 • 100 • 125 • 150 • 200 • 250 • 300 • 350 • 400 • 450 • 500 • 600 • 700 • 800 • 900 • 1000 • 1100

Step	Screen (English)	Screen (Japanese)	Procedure
5			Touch the ⇨ key until the cursor is back at the mode indicator

✔ : Can be used

Size/Detector Model No.	MGG	KID	NNM	NNK
2.5	✔	✔		
5.0	✔	✔		
10.0	✔	✔		
15.0	✔	✔		
25.0	✔	✔	✔	
40.0	✔	✔	✔	
50.0	✔	✔	✔	✔
65.0	✔			
80.0	✔	✔	✔	
100.0	✔	✔	✔	✔
125.0	✔			
150.0	✔	✔	✔	
200.0	✔	✔	✔	✔
250.0	✔	✔	✔	
300.0	✔	✔	✔	
350.0	✔	✔	✔	
400.0	✔	✔	✔	✔
450.0	✔		✔	
500.0	✔	✔		
600.0	✔	✔	✔	✔
700.0	✔		✔	
800.0	✔		✔	
900.0	✔			
1000.0	✔			
1100.0	✔			

~ Note *For MGG and KID type detectors, set the detector factor (EX) as the value stamped on the name plate. For NNM and NNK if you need to replace a converter with a new one, contact your YAMATAKE representative.*

Setting the Number of Dummy Detectors

This is used to set number of dummy detectors installed with the NNK detector (selected in the detector data setting).

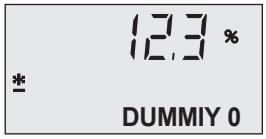
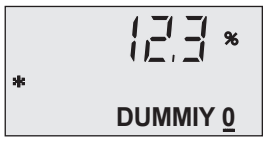
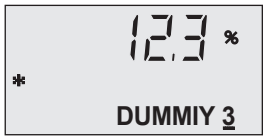
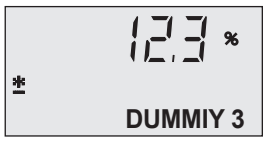
This screen appears only for open channel type electromagnetic flowmeter NNK.

Default setting

0

Setting range

0 to 9

Step	Screen (English)	Screen (Japanese)	Procedure
1			Enter BASIC SETUP MODE (see page 4-11). Use the ⇧ or ⇩key to cycle through the screens until the detector DATA screen appears. Touch the ⇨ key move the cursor to the detector type. Change the detector type as NNK using the ⇧ key.
2			Touch the ⇨ key once.
3			Use the ⇧ or ⇩key to input the number of dummy detectors. In this example, the number of the dummy detectors has been changed from 0 to 3.
4			Touch the ⇨ key once to move the cursor to the mode indicator.

Flow rate range

This function is used to set the flow rate range (the value when the analog output reaches 100%). In this screen, three values can be changed: flow rate value, flow rate unit, and time unit.

Setting range

Flow rate: 0.00001 to 99999

Unit: m^3, l, cm^3, t, kg, g, BPH, KGPH, GPH, mGPH, lb, KGPM,GPM, mGPM

Time unit: s, min., h, d

Step	Screen (English)	Screen (Japanese)	Procedure
1	12.3 % * 1.4147 m/s SPAN 10.000 m3/h	12.3 % * レンジ 1.4147 m/s SPAN 10.000 m³/h	Enter BASIC SETUP MODE (see page 4-11).Use the ⇩ or ⇧ key to cycle through the screens until the SPAN screen appears.
2	12.3 % * 1.4147 m/s SPAN 10.000 m3/h	12.3 % * レンジ 1.4147 m/s SPAN 10.000 m³/h	Touch the ⇨ key until the cursor is at the flow rate value to be changed.
3	12.3 % * 2.8294 m/s SPAN 20.000 m3/h	12.3 % * レンジ 2.8294 m/s SPAN 20.000 m³/h	Touch the ⇩ or ⇧ key to change the value.
4	12.3 % * 2.8294 m/s SPAN 20.000 l/h	12.3 % * レンジ 2.8294 m/s SPAN 20.000 l/h	Use the ⇨ key to move the cursor to the flow rate unit.Touch the ⇩ or ⇧ key to change the unit. **⚠ CAUTION** If a weight unit is set, the Specific Gravity must also be set to avoid output errors.
5	12.3 % * 2.8294 m/s SPAN 333.33 l/min	12.3 % * レンジ 2.8294 m/s SPAN 333.33 l/min	Use the ⇨ key to move the cursor to the time unit.Touch the ⇩ or ⇧ key to change the unit. **Available units:** h, min., s, d
6	12.3 % # 2.8294 m/s SPAN 333.33 l/min	12.3 % # レンジ 2.8294 m/s SPAN 333.33 l/min	Touch the ⇨ key until the cursor is back at the mode indicator.

Flow rate indication

This function selects the flow rate indication displayed on screen. The data can be displayed as a percent (%), the actual flow rate (RATE) or the totalized value (TOTAL)

Default setting

As specified when ordered.

Setting range

%(flow rate in percent), RATE (actual flow rate), TOTAL (totalized value)

Step	Screen (English)	Screen (Japanese)	Procedure
1	0.0 % * DISPLAY SELECT %	0.0 % * ヒョウジセンタク %	Enter BASIC SETUP MODE (see page 4-11).Use the ⇩ or ⇧ key to cycle through the screens until the DISPLAY SELECT screen appears.
2	0.0 % *DISPLAY SELECT %	0.0 % * ヒョウジセンタク %	Touch the ⇨ key once to move the cursor to the flow rate indication value.
3	0.000 RATE *DISPLAY SELECT RATE ↓ 12679 TOTAL *DISPLAY SELECT TOTAL	0.000 RATE * ヒョウジセンタク RATE ↓ 12679 TOTAL * ヒョウジセンタク TOTAL	Touch the ⇩ or ⇧ key to scroll through the selections (%, RATE or TOTAL). Note that the Main Display changes as the different display selections appear. The current flow rate indication value appears at the upper right in the Main Display.
4	0.000 RATE * DISPLAY SELECT RATE	0.000 RATE * ヒョウジセンタク RATE	Touch the ⇨ key until the cursor is back at the mode indicator.

Entering ENGINEERING / ADVANCED / MAINTENANCE MODE

This is to describe how to enter ENGINEERING, ADVANCED and MAINTENANCE MODE.

~ CAUTION *Check the write protection level to enter each mode (See page 2-19).*

Entering ENGINEERING MODE

Step	Screen (English)	Screen (Japanese)	Procedure
1	12.3 % * MODE ENTER ENGINEERING	12.3 % *モードヲイドウシマスカ？ エンジニアリング　モード	Enter BASIC SETUP MODE (see page 4-11). Use the ⇩ or ⇧ key to cycle through the screens until the MODE ENTER ENGINEERING screen appears.
2	12.3 % * MODE ENTER ENGINEERING	12.3 % *モードヲイドウシマスカ？ エンジニアリング　モード	Touch the ⇨ key once to move the cursor to ENGINEERING.
3	12.3 % * ENGINEERING MODE	12.3 % * エンジニアリング モード	Touch the ⇧ key to select. The ENGINEERING MODE screen appears.
4	12.3 % * FUNC SET FQAXX	12.3 % * キノウセッテイ FOAXX	Two seconds later, Function set screen appears.

Entering ADVANCED MODE

Step	Screen (English)	Screen (Japanese)	Procedure
1	12.3 % * MODE ENTER ADVANCED	12.3 % *モードヲイドウシマスカ？ アドバンスト　モード	Enter BASIC SETUP MODE (see page 4-11). Use the ⇩ or ⇧ key to cycle through the screens until the MODE ENTER ADVANCED screen appears.
2	12.3 % * MODE ENTER ADVANCED	12.3 % *モードヲイドウシマスカ？ アドバンスト　モード	Touch the ⇨ key once to move the cursor to ADVANCED.

Step	Screen (English)	Screen (Japanese)	Procedure
3	12.3 % & ADVANCED MODE	12.3 % & アドバンスト モード	Touch the ⇧ key to select. The ADVANCED MODE screen appears.
4	12.3 % & DAMPING 003.0S	12.3 % & ダンピング 003.0S	Two seconds later, DAMPING screen appears.

Entering MAINTENANCE MODE

Step	Screen (English)	Screen (Japanese)	Procedure
1	12.3 % ± MODE ENTER MAINTENACE	12.3 % ±モードヲイドウシマスカ？ メンテナンス　モード	Enter BASIC SETUP MODE (see page 4-11). Use the ⇩ or ⇧ key to cycle through the screens until the MODE ENTER MAINTENANCE screen appears.
2	12.3 % * MODE ENTER MAINTENACE	12.3 % *モードヲイドウシマスカ？ メンテナンス　モード	Touch the ⇨ key once to move the cursor to MAINTENANCE.
3	12.3 % ≥ MAINTENACE MODE	12.3 % ≥ メンテナンス モード	Touch the ⇧ key to select. The MAINTENANCE MODE screen appears.
4	12.3 % ≥ OUTPUT CHECK MODE OFF	12.3 % ≥ シュツリョクチェック OFF	Two seconds later, OUTPUT CHECK MODE screen appears.

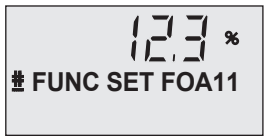
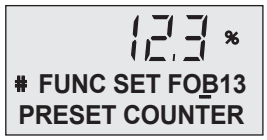
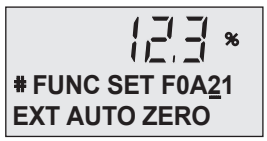
Selecting functions

Introduction

Sets the electromagnetic flowmeter functions: range, counter, contact input, and contact output.

There will be restrictions on the functions that can be set depending on your model's specifications. Note that the setting range will be limited depending on the selection of contact input/output.

The possible combinations are shown on the following pages.

Step	Screen (English)	Screen (Japanese)	Procedure
1			Enter ENGINEERING MODE (see page 4-23).
2			Touch the ⇨ key to select the kind of function settings. 1st character is for range setting, 2nd is for built-in counter setting, 3rd is for contact input function setting and 4th is for contact output function setting.
3			Touch the ⇩ or ⇧ key to select the desired function.
4			Two touches of the ⇨ key in step 1 enables the selection of the built-in counter function. Touch the ⇩ or ⇧ key to select the desired function.
5			Three touches of the ⇨ key in step 1 enables the selection of the contact input function. Touch the ⇩ or ⇧ key to select the desired function.
6			Four touches of the ⇨ key in step 1 enables the selection of the contact output function. Touche the ⇩ or ⇧ key to select the desired function.

Step	Screen (English)	Screen (Japanese)	Procedure
7			When completing the setting of the respective functions, touch the ⇨ key to move the cursor to the "#".

Relations for setting function FXXXX

Introduction

The range, built-in counter, contact input, and contact output functions can be set using the combinations shown in the table below. For example, when “Single range” and “Addition with preset” are selected, there are three contact input choices (X, 1, and 2) and three contact output choices.

1-contact input and 1-contact output (DI/DO)

Range function	Built-in counter function	Contact input function	Contact output function
0: Single range	A: Addition	X: Not activated	X: Not activated
			1: Alarm output
			4: Self-check result output
			5: Empty detection function
			6: High/low limit alarm
		1: External 0% lock	X: Not activated
			1: Alarm output
			4: Self-check result output
			5: Empty detection function
			6: High/low limit alarm
		2: External auto zeroing	X: Not activated
			1: Alarm output
			4: Self-check result output
			5: Empty detection function
			6: High/low limit alarm
		4: Counter reset	X: Not activated
			1: Alarm output
			4: Self-check result output
			5: Empty detection function
			6: High/low limit alarm
	B: Addition with preset	X: Not activated	3: Preset output
		1: External 0% lock	3: Preset output
		2: External auto zeroing	3: Preset output
1: Automatic switching dual range function	A: Addition	X: Not activated	2: Range switching output
		1: External 0% lock	2: Range switching output
		2: External auto zeroing	2: Range switching output
		4: Counter reset	2: Range switching output
2: External switching dual range	A: Addition	3: External range switching	X: Not activated
			1: Alarm output
			2: Range switching output
			4: Self-check result output
			5: Empty detection function
			6: High/low limit alarm
	B: Addition with preset	3: External range switching	3: Preset output
3: Normal/reverse automatic switching range	A: Addition	X: Not activated	2: Range switching output
		1: External 0% lock	2: Range switching output
		2: External auto zeroing	2: Range switching output
		4: Counter reset	2: Range switching output
	C: Normal/reverse totalization	X: Not activated	2: Range switching output
		1: External 0% lock	2: Range switching output
		2: External auto zeroing	2: Range switching output
		4: Counter reset	2: Range switching output

Range function	Built-in counter function	Contact input function	Contact output function
4: Normal/reverse external switching range	A: Addition	3: External range switching	X: Not activated
			1: Alarm output
			2: Range switching output
			4: Self-check result output
			5: Empty detection function
			6: High/low limit alarm
	B: Addition with preset	3: External range switching	3: Preset output
	C: Normal/reverse totalization	3: External range switching	X: Not activated
			1: Alarm output
			2: Range switching output
			4: Self-check result output
			5: Empty detection function
			6: High/low limit alarm

2- contact inputs

Range function	Built-in counter function	Contact input function	Contact output function
0: Single range	A: Addition	X: Not activated	X: Not activated
		1: External 0% lock	X: Not activated
		2: External auto zeroing	X: Not activated
		4: Counter reset	X: Not activated
		5: External 0% lock + Auto zeroing	X: Not activated
		7: External 0% lock + Counter reset	X: Not activated
		9: External auto zeroing + Counter reset	X: Not activated
2: External switching dual range	A: Addition	3 External range switching	X: Not activated
		6: External 0% lock + Range switching	X: Not activated
		8: External auto zeroing + Range switching	X: Not activated
		A: External range switching + Counter reset	X: Not activated
4: Normal/reverse external switching range	A: Addition	3 External range switching	X: Not activated
		6: External 0% lock + Range switching	X: Not activated
		8: External auto zeroing + Range switching	X: Not activated
		A: External range switching + Counter reset	X: Not activated
	C: Normal/reverse totalization	3 External range switching	X: Not activated
		6: External 0% lock + Range switching	X: Not activated
		8: External auto zeroing + Range switching	X: Not activated
		A: External range switching + Counter reset	X: Not activated

2- contact outputs

Range function	Built-in counter function	Contact input function	Contact output function
0: Single range	A: Addition	X: Not activated	X: Not activated
			E: High 1 and High 2 alarm or Low 1 and Low 2 alarm
			1: Alarm output
			4: Self-check result output
			5: Empty detection function
			6: High/low limit alarm
	B: Addition with preset	X: Not activated	3: Preset output
			D: Alarm + Preset output
			F: Preset + Self-check
			G: Preset + Empty detection
			H: Preset + High/low limit alarm
			I: Self-check result + Empty detection
			J: Self-check result + High/low limit alarm
			K: Empty detection + High/low limit alarm
1: Automatic switching dual range	A: Addition	X: Not activated	2: Range switching output
			7: Alarm + Range switching output
			8:Self-check result + Range switching output
			9: Empty detection + Range switching output
			A: High/low limit alarm + Range switching output
			C: Range switching output + Self-check, Empty detection
	B: Addition with preset	X: Not activated	B: Range switching output + Preset output
3: Normal/reverse automatic switching range	A: Addition	X: Not activated	2: Range switching output
			7: Alarm + Range switching output
			8:Self-check result + Range switching output
			9: Empty detection + Range switching output
			A: High/low limit alarm + Range switching output
			C: Range switching output + Self-check, Empty detection
	B: Addition with preset	X: Not activated	B: Range switching output + Preset output
	C: Normal/ reverse totalization	X: Not activated	2: Range switching output
			7: Alarm + Range switching output
			8:Self-check result + Range switching output
			9: Empty detection + Range switching output
			A: High/low limit alarm + Range switching output
			C: Range switching output + Self-check, Empty detection

Range functions

Single range

Measures a single range in the normal direction.
The output for a reverse flow will be as follows

Analog output: Possible to approx. -20% (0.8 mA). With communication, to approx. -5% (3.2 mA).

Pulse output: No output

Display: A minus (-) symbol appears.

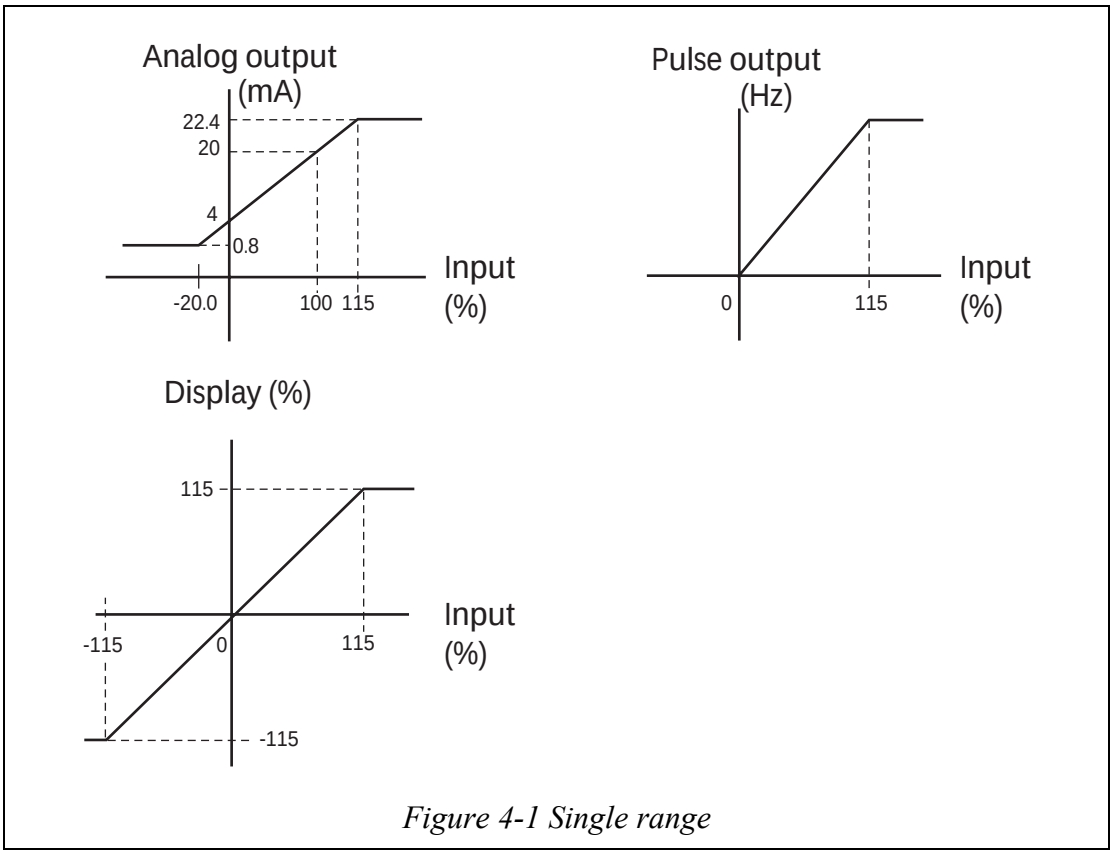


Figure 4-1 Single range

Normal direction automatic dual range

This function has two ranges: wide and narrow. When the narrow range measurement exceeds 100%, the unit automatically changes to the wide range.

This function should be used in combination with the wide/narrow range distinction output contact. Hysteresis setting is available when dual range is selected.

① When AUTO is selected for an analog output

Range No.1 4 to 20 mA DC
Range No.2 4 to 20 mA DC

② When WIDE is selected for an analog output

4 to 20 mA DC is output according to either range No.1 or range No.2, whichever has the wider range.

When there is a pulse output

The pulse weight is the same for both ranges No.1 and No.2.

Contact output

At shipment, the contact output status of the distinction status signal for ranges No.1 and No.2 is as follows.

Range No.1: Closed
Range No.2: Open

Reverse setting is also possible.

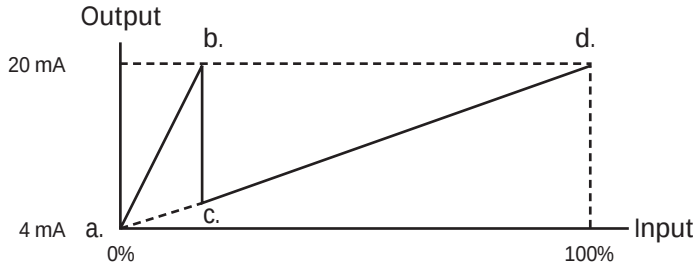


Figure 4-2 Normal direction automatic dual range

(Example)

① AUTO range

Range No.1 (narrow range): Outputs 4 to 20 mA for 0 to 10 m^3/h (a-b).

Range No.2 (wide range): Outputs 4 to 20 mA for 0 to 40 m^3/h (a-d)

② WIDE range

Range No.1 (narrow range): Outputs 4 to 8 mA for 0 to 10 m^3/h (a-c).

Range No.2 (wide range): Outputs 8 to 20 mA for 10 to 40 m^3/h (c-d).

Normal direction, external switching dual range

The range is switched via an external switching command to the contact input.
Also, the wide/narrow range distinction contact output (status signal) can be sent out using the same timing.

Analog output

① When AUTO is selected for an analog output

Range No.1 4 to 20 mA DC
Range No.2 4 to 20 mA DC

② When WIDE is selected for an analog output

4 to 20 mA DC is output according to either range No.1 or range No.2 whichever has the wider range.

When there is a pulse output

The pulse weight is the same for both ranges No.1 and No.2.

Contact input

Range switching command contact input

Range No.1: Close
Range No.2: Open

Contact output (select functions as required.)

Range switching distinction status signal
The contact output status at shipment is as follows.

Range No.1: Closed
Range No.2: Open

Reverse setting is also possible.

Normal/reverse automatic switching range

Automatically switches the range when the fluid flow direction reverses.
Hysteresis setting is available when normal/reverse switching is selected.

Analog output

Normal direction: 4 to 20 mA DC
Reverse direction: 4 to 20 mA DC

When there is a pulse output

There is no distinction in output between the normal and reverse directions. The pulse weight is also the same.
The built-in counter simply integrates the flow rate without distinguishing normal and reverse directions. However, when normal/reverse differential flow integration is selected, integration of the "-" direction (subtraction) is available.

Example: In the normal direction
-100 → -99 → -98 →... 0 → 1, 2, 3
In the reverse direction
100 → 99 → 98... 0 → -1, -2, -3

With indication

With a reverse flow rate, the "-" symbol will appear on the flow rate display. With built-in counter, it is possible to select the normal/reverse differential flow integration function.

Contact output

Normal/reverse distinction status signal
The contact output status at shipment is as follows.
Range No.1: Closed
Range No.2: Open
Reverse setting is also possible

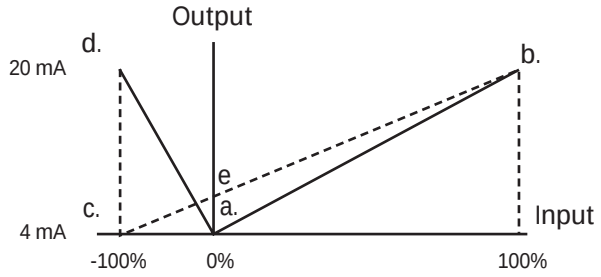


Figure 4-3 Normal/reverse automatic switching range

(Example of setting)

① AUTO range

- Range No.1 (normal range): Outputs 4 to 20 mA for 0 to 30 m^3/h (a-b).
- Range No.2 (reverse range): Outputs 4 to 20 mA for 0 to -10 m^3/h (a-d).

② WIDE range

- Outputs 4 to 8 mA for -10 to 0m^3/h (c-e), 8 to 20 mA for 0 to 30m^3/h (e-b).

When WIDE is selected, Low-flow-cut is not performed.

Normal / Reverse external switching range

Switches between the normal and reverse ranges by inputting a switching command contact from the host system or controller.

It is also possible to output the normal/reverse range distinctive contact output (status signal) using the same timing.

Analog output

① When AUTO is selected for an analog output

Normal direction: 4 to 20 mA DC

Reverse direction: 4 to 20 mA DC

② When WIDE is selected for an analog output

4 to 20 mA DC is output according to either range No.1 or range No.2, whichever has the wider range.

With pulse output

There is no distinction in output between the normal and reverse directions. The pulse weight is also the same.

The built-in counter simply integrates the flow rate without distinguishing between the normal and reverse directions. However, when normal/reverse differential flow integration is selected, the integration of the "-" direction (subtraction) is available.

Example: In the normal direction

-100 → -99 → -98... 0 → 1, 2, 3

In the reverse direction

100 → 99 → 98... 0 → -1, -2, -3

With indication

With a reverse flow rate, the "-" symbol will appear on the flow rate display.

For the built-in counter, it is possible to select the normal/reverse differential flow integration function.

Contact input

Range switching command contact input

Normal direction:when opened

Reverse direction:when closed

Contact output (select the function required.)

Normal/reverse distinction status signal

The contact output status at shipment is as follows.

Range No.1: Closed

Range No.2: Open

Reverse setting is also possible.

[Built-in counter function]

A: Addition counter

In the normal/reverse range, addition is performed in the normal and reverse directions, respectively.

B: Addition counter with preset

The preset value ranges from 0000000000 - 9999999999.

In the normal/reverse range, addition is made in the normal and reverse directions, respectively.

C: Normal/reverse differential flow rate integration display

Displays the difference in integration between the normal and reverse directions.

It is necessary to determine the direction: normal or reverse.

[Contact input function]

This function can be set when either 1- or 2-contact input has been selected in the additional specifications.

X: Not activated

1: External 0% lock input

Use to completely halt the flow rate signal (display, analog output, or pulse output) at 0%.

2: External auto zero adjustment input

Enables zero adjustment from a remote location.
Zero adjustment is possible when the contact is ON for 0.2 seconds or more.
Be sure to stop the fluid.

3: External range switching input

Range No.1 or normal direction: when opened
Range No.2 or reverse direction: when closed

4: Built-in counter reset input

Reset will take effect when the contact is ON for 0.2 seconds or more, and counting will start from the counter reset value at the moment when the contact turns OFF.

5: External 0% lock input and external auto zero adjustment input

Terminal ST IN1 can be set to external 0% lock input and terminal ST IN2 to external auto zero adjustment input.

6: External 0% lock input and external range switching input

Terminal ST IN1 can be set to external 0% lock input and terminal ST IN2 to external range switching input.

7: External 0% lock input and built-in counter reset input

Terminal ST IN1 can be set to external 0% lock input and terminal ST IN2 to the built-in counter reset input.

8: External auto zero adjustment input and external range switching input

Terminal ST IN1 can be set to external auto zero adjustment input and the terminal ST IN2 to external switching input.

9: External auto zero adjustment input and built-in counter reset input

Terminal ST IN1 can be set to auto zero adjustment input and terminal ST IN2 to built-in counter reset input.

A: External range switching input and built-in counter reset input

Terminal ST IN1 can be set to external range switching input and terminal ST IN2 to built-in counter reset input.

[Contact output function]

This function can be set when 1- or 2-contact output has been selected in the additional specifications.

X: Not activated

1: Alarm contact output
An alarm is output when any of the following items becomes abnormal.
The abnormal item can be checked on the display of the instrument.
Also, external confirmation is available using the SFC.

① Self-diagnostic
- Coil disconnection
- ROM error
- RAM error
- NVM error
- ADC error

Table 4-2 Output selection

Mode selection	Fail-safe direction high (HIGH)	Hold (HOLD)	Fail-safe direction low (LOW)
Analog output 4 to 20 mA	Fail-sage high (HIGH) without SFC communication: 24 mA DC with SFC communication: 23.8 mA DC	Hold (HOLD)	Fail-safe direction low (LOW) Without SFC communication: 0.8 mA DC With SFC communication: 2.96 mA DC
Pulse output	—	Hold (HOLD)	Fail-safe direction low (LOW) No output
Contact output	Abnormal status (Open/closed can be freely selected.)		

⚠ CAUTION

If the power supply is turned OFF with the “Fail-safe direction high” setting, the 4-20 mA output will emit a Fail-safe direction high output once. Pay close attention when turning the power supply OFF.

② Empty detection function

When the detector becomes empty, the respective output signals will be as follows.

Status / Output signal	When the detector is empty
Analog output 4-20 mA DC	4 mA DC
Pulse output	0%
Contact output	Abnormal status (Open/closed can be freely selected.)

~ Note *This function can be used when the conductivity is 30 μS/cm or greater. The empty detection function selector switch determines whether this function is activated or not. (The empty detection function is set to "NOT activated" as default setting.)*

~ Note *Using the empty detection function with a conductivity of 30 μS/cm or less will cause a measurement error.*

③ High/low limit alarm function

According to preset High/low limit value, alarm signal is output through ST.OUT terminal.

2: Range switching output
The contact output status at shipment is as follows.
Range No.1 or normal direction: Closed
Range No.2 or reverse direction: Open
Reverse setting is also possible.

3: Counter preset status output
Activated when the counter reaches the preset value.

4: Self-check result output
Activated only when a self-diagnostic abnormality occurs in the alarm contact output of code 1.

5: Empty detection function
Activated only when an empty status is detected in the alarm contact output of code 1.

6: High/low limit alarm
Activated only when a high/low limit alarm occurs in the alarm contact output of code 1.

7: Alarm contact output and range switching output (2-contact output)
The alarm contact output can be set to ST.OUT1 and the range switching output to ST.OUT2.

8: Self-check result output and range switching output (2-contact output)
The self-diagnostic result output can be set to ST.OUT1 and the range switching output to ST.OUT2.

9: Empty detection function and range switching output (2-contact output)
The empty status detection output can be set to ST.OUT1 and the range switching output to ST.OUT2.

A: High/low limit alarm and range switching output (2-contact output)

The high/low limit alarm can be set to ST.OUT1 and the range switching output to ST.OUT2.

B: Range switching output and counter preset status output (2-contact output)

The range switching output can be set to ST.OUT1 and the preset status output to ST.OUT2.

C: Range switching output and (self-check result output or empty detection) (2-contact output)

The range switching output can be set to ST.OUT1 and the output when either a self-check result or empty detection abnormality occurs to ST.OUT2.

D: Alarm contact output and counter preset status output (2-contact output)

The alarm contact output can be set to ST.OUT1 and the counter preset status output to ST.OUT2.

E: 2-stage flow rate alarm output

The high/low limit alarm can be set to ST.OUT1 and the 2-stage high limit alarm or 2-stage low limit alarm to ST.OUT2.

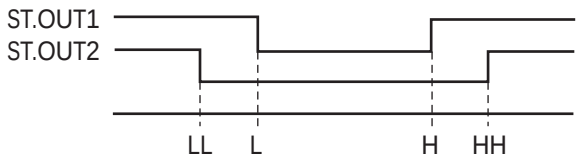


Figure 4-4 2-stage flow rate alarm output

F: Counter preset status output and self-check result output (2-contact output)

The counter preset status output can be set to ST.OUT1 and the self-check result output can be set to ST.OUT2.

G: Counter preset status output and empty detection function

The counter preset status output can be set to ST.OUT1 and empty detection function can be set to ST.OUT2.

H: Range switching output and High/low limit alarm output

The range switching output can be set to ST.OUT1 and High/low limit alarm can be set to ST.OUT2.

I: Self-check result output and empty detection function

The self-check result can be set to ST.OUT1 and empty detection function can be set to ST.OUT2.

J: Self-check result output and High/low limit alarm

The self-check result can be set to ST.OUT1 and the high/low alarm can be set to ST.OUT2.

K: Empty detection function and High/low limit alarm

The empty detection function can be set to ST.OUT1 and the high/low limit alarm can be set to ST.OUT2.

Flow rate range

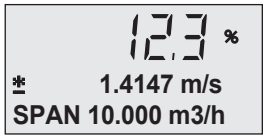
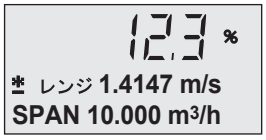
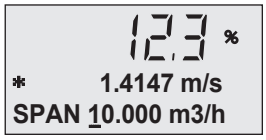
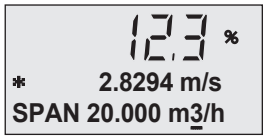
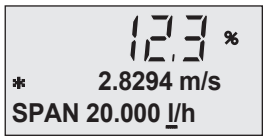
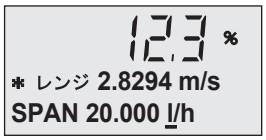
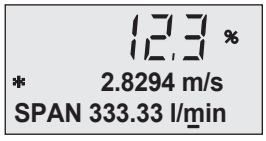
This function is used to set the flow rate range (the value when the analog output reaches 100%). In this screen, three values can be changed: flow rate value, flow rate unit, and time unit.

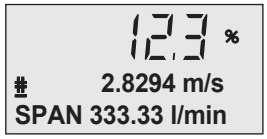
Setting range

Flow rate: 0.00001 to 99999

Unit: m^3, l, cm^3, t, kg, g, BPH, GPH, mGPH, lb, KGPM, GPM, mGPM

Time unit: s, min., h, d

Step	Screen (English)	Screen (Japanese)	Procedure
1			Enter ENGINEERING MODE (see page 4-11).Use the ⇩ or ⇧ key to cycle through the screens until the SPAN (range) screen appears.
2			Touch the ⇨ key until the cursor is at the flow rate value to be changed.
3			Touch the ⇩ or ⇧ key to change the value.
4			Use the ⇨ key to move the cursor to the flow rate unit.Touch the ⇩ or ⇧ key to change the unit. **⚠ CAUTION** If a weight unit is set, the Specific Gravity must also be set to avoid output errors.
5			Use the ⇨ key to move the cursor to the time unit.Touch the ⇩ or ⇧ key to change the unit. **Available units:** h, min., s, d

Step	Screen (English)	Screen (Japanese)	Procedure
6			Touch the ⇨ key until the cursor is back at the mode indicator.

Setting hysteresis

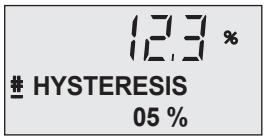
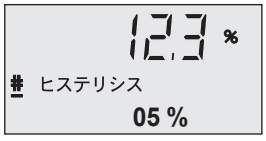
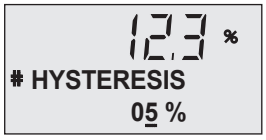
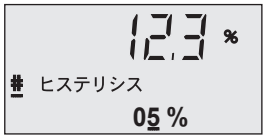
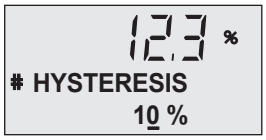
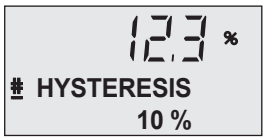
This is used to set the hysteresis as a range function to be used at range switching. Use for normal direction automatic dual range or the normal/reverse direction automatic range.

Default setting

0%

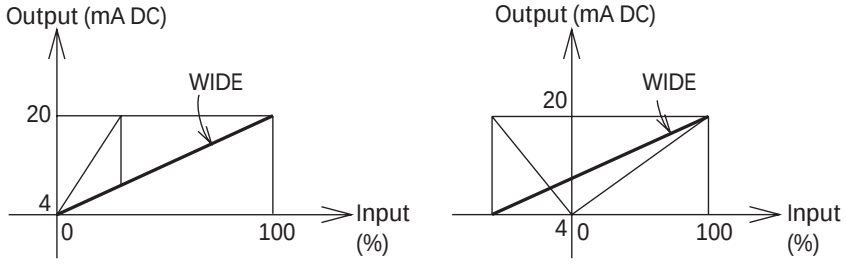
Setting range

0-20%

Step	Screen (English)	Screen (Japanese)	Procedure
1			Open the hysteresis setup screen by following the steps to enter the engineering mode. (See page 4-11)
2			Touch the ⇨ key once.
3			Use the ⇩ and ⇧ keys to input the desired hysteresis value. In this example, here the hysteresis is changed from 5% to 10%.
4			Touch the ⇨ key to move the cursor to the "#".

Selecting the current output method for dual range

This is used as a range function with the normal direction dual range or normal/reverse direction dual range, to select how to output the 4-20 mA analog output: with either the range switching method or the wider range method.



Normal direction dual range Normal/reverse direction dual range

Figure 4-5 Selecting the current output method for dual range

Default setting

AUTO

Setting the range

Either AUTO or WIDE

Step	Screen (English)	Screen (Japanese)	Procedure
1	12.3 % # I. OUT RANGE AUTO	12.3 % # 4-20レンジキリカエ AUTO	Open the current output method selection screen by following the steps to enter the engineering mode.
2	12.3 % # I. OUT RANGE AUTO	12.3 % # 4-20レンジキリカエ AUTO	Touch the ⇨ key once.
3	12.3 % # I. OUT RANGE WIDE	12.3 % # 4-20レンジキリカエ WIDE	Use the ⇩ and ⇧ keys to select the AUTO or WIDE.
4	12.3 % # I. OUT RANGE WIDE	12.3 % # 4-20レンジキリカエ WIDE	Touch the ⇨ key to move the cursor to the "#".

Setting / Changing the preset value of the built-in flow counter

This changes the contact output status from H to L or from L to H when the flow counter reaches a preset value.

This function is used when contact output has been selected.

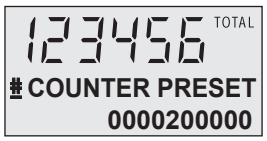
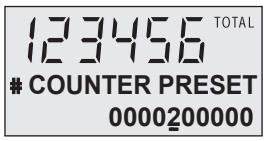
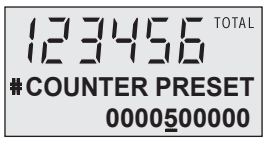
Also, be sure to select the preset counter for the contact output in function setting. (See page 4-25)

Default setting

The preset value is set to “0000000000” at shipment.

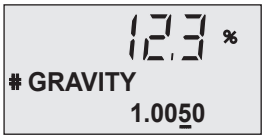
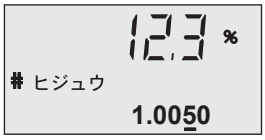
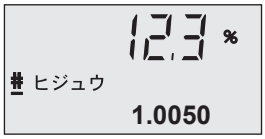
Setting range

0000000000 - 9999999999

Step	Screen (English)	Screen (Japanese)	Procedure
1			Open the built-in flow counter preset value setup screen by following the steps to enter the Engineering mode.
2			Touch the ⇨ key to move the cursor to the desired digits. In this example, the cursor is moved to the “2” position by touching the RIGHT SHIFT key five times.
3			Touch the ⇩ or ⇧ key to set the desired numbers. In this case, the numeral “2” is changed to “5” by three touches of the increment key.
4			When the counter reset value has been changed, touch the ⇨ key to return the cursor to the “#”.

Specific gravity

This function is used to set the specific gravity when selecting a weight unit (t, kg, g, lb) in the flow rate measurement range setting.

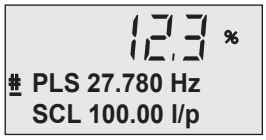
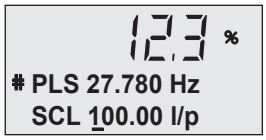
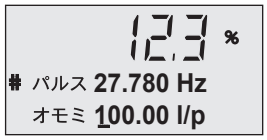
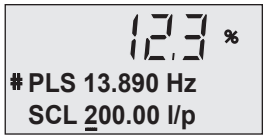
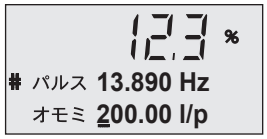
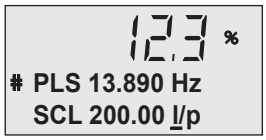
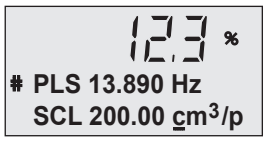
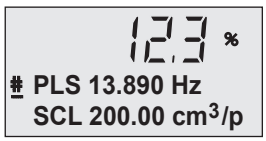
Step	Screen (English)	Screen (Japanese)	Procedure
1			Enter ENGINEERING MODE (see page 4-23). Use the ⇩ or ⇧ key to cycle through the screens until the GRAVITY screen appears.
2			Touch the ⇨ key until the cursor is at the value to be changed. **Default setting:** 1.0000 **Setting range:** 0.1000 to 9.9999
3			Touch the ⇩ or ⇧ key to change the value.
4			Touch the ⇨ key until the cursor is back at the mode indicator.

Pulse weight

This function is used to set the pulse weight value and pulse weight unit.

Pulse weight should be set so that pulse frequency indicated on the display is between 0.00006 and 3000Hz.

When changing the pulse weight with the dual range, use the wider range.

Step	Screen (English)	Screen (Japanese)	Procedure
1			Enter ENGINEERING MODE (see page 4-23). Use the ⇩ or ⇧ key to cycle through the screens until the PLS (pulse weight) screen appears.
2			Touch the ⇨ key until the cursor is at the pulse weight value to be changed. **Default setting**: 100.00 cm^3/P.
3			Touch the ⇩ or ⇧ key to change the value.
4			Use the ⇨ key to move the cursor to the pulse weight unit.
5			Touch the ⇩ or ⇧ key to change the pulse weight unit. **⚠ CAUTION** Pulse weight units must match span units.
6			Touch the ⇨ key until the cursor is back at the mode indicator.

Setting the pulse width

This is used to set the pulse width so that the duty ratio at the upper right of the 16-digit display will not exceed 70%.

When changing the pulse width with a dual range, use the wider range.

Default setting

DUTY 50%

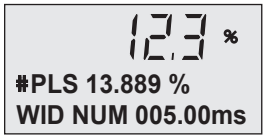
Setting range

Pulse width: "NUM", "DUTY 50%"

Pulse width: 000.10 to 999.99 ms
When "NUM" is selected, the pulse width can be set freely.
When "DUTY" is selected, "DUTY" is fixed at 50%.

When using "DUTY" and the pulse frequency is 0.5Hz or less, the pulse ON duration is fixed at one second.

Step	Screen (English)	Screen (Japanese)	Procedure
1	12.3 % #PLS 27.778 % WID NUM 010.00ms	12.3 % #パルス 27.778 % ハバ NUM 010.00ms	Open the pulse width setup screen by following the steps to enter the engineering mode.
2	12.3 % #PLS 27.778 % WID NUM 010.00ms	12.3 % #パルス 27.778 % ハバ NUM 010.00ms	Use the ⇨ key to move the cursor to "NUM".
3	12.3 % # PLS WID DUTY 50%	12.3 % #パルス ハバ DUTY 50%	By touching the ⇧ key, the screen used to enter a numerical value pulse width will change to the screen used to fix the duty ratio at 50%.
4	12.3 % #PLS 27.778 % WID NUM 010.00ms	12.3 % #パルス 27.778 % ハバ NUM 010.00ms	To enter the pulse width using a numerical value, return to the numerical value entry screen by using the ⇧ key, and move the cursor to the desired digits using the ⇨ key.
5	12.3 % #PLS 13.889 % WID NUM 005.00ms	12.3 % #パルス 13.889 % ハバ NUM 005.00ms	Use the ⇩ and ⇧ keys to change the numbers.

Step	Screen (English)	Screen (Japanese)	Procedure
6			Touch the ⇨ key to move the cursor to the "#".

Setting high and low limit alarms

An alarm is output when the instantaneous percent flow rate exceeds the preset high and low limits.

Important

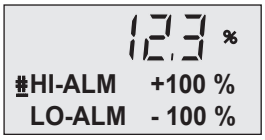
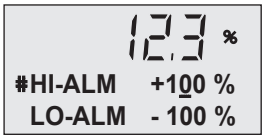
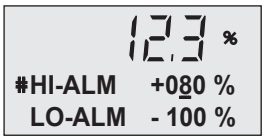
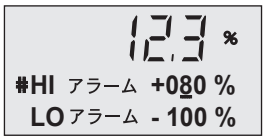
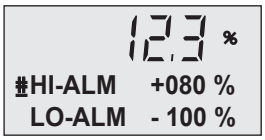
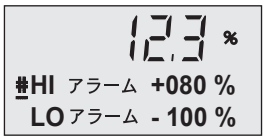
This function can be used when the high/low limit alarm is selected in the contact output function.

Default setting

HI-ALM +115%, LO-ALM -115%

Setting range

HI-ALM -115 to +115%, LO-ALM -115 to +115%

Step	Screen (English)	Screen (Japanese)	Procedure
1			Open the high and low limit alarm setup screen by following the steps to enter the engineering mode.
2			Use the ⇨ key to move the cursor to desired digit.
3			Use the ⇩ and ⇧ keys to change the numbers.
4			Touch the ⇨ key to move the cursor to the "#".

Make sure to set so that HI-ALM>LO-ALM.

Setting a 2-stage flow rate alarm

The first alarm will be output when the instantaneous percent flow rate exceeds the preset first high or low limit. The second alarm will be output when the flow rate exceeds the second high or low limits.

Important

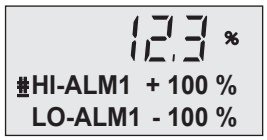
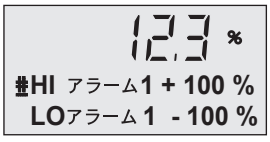
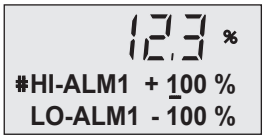
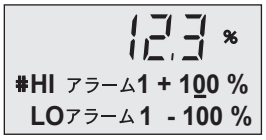
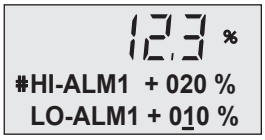
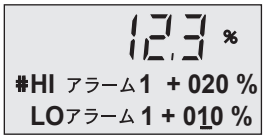
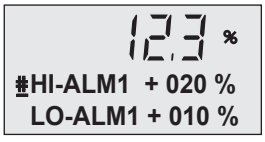
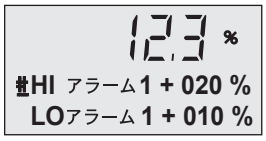
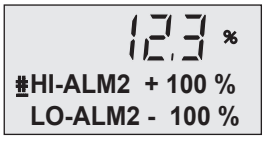
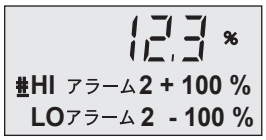
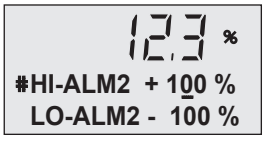
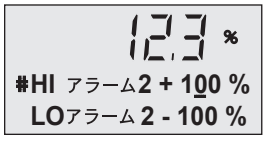
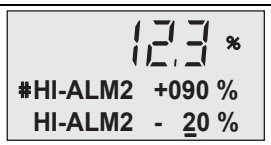
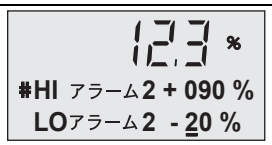
This function can be used when the 2-stage high/low limit alarm is selected in the contact output function.

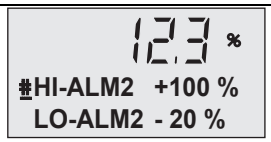
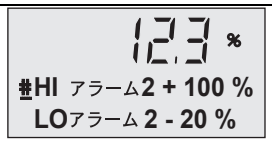
Default setting

HI-ALM1, HI-ALM2 +115% LO-ALM1, LO-ALM2 -115%

Setting range

HI-ALM1, HI-ALM2 -115 to +115% LO-ALM1, LO-ALM2 -115 to +115%

Step	Screen (English)	Screen (Japanese)	Procedure
1			Open the 2-stage high/low limit alarm setup screen by following the steps to enter the engineering mode.
2			Use the ⇨ key to move the cursor to the desired digits.
3			Use the ⇩ and ⇧ keys to change the numbers.
4			Touch the ⇨ key to move the cursor to the "#".
5			Touch the ⇧ key to set the 2-stage high limit alarm in the same way.
6			Use the ⇨ key to move the cursor to the desired digits.
7			Use the ⇩ and ⇧ keys to change the numbers.

Step	Screen (English)	Screen (Japanese)	Procedure
8			Touch the ⇨ key to move the cursor to the "#".

Selecting fail-safe mode for the analog output

This function is used to determine the analog output direction when the electromagnetic flowmeter detects a critical status condition.

⚠ CAUTION

The fail-safe mode is very important for overall safety of the control process. Choose the fail-safe direction carefully, as equipment damage can result from a wrong choice.

Default setting

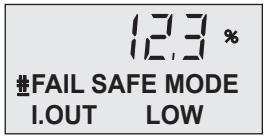
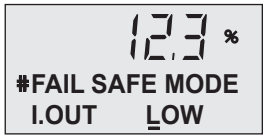
"LOW"

Setting range

"LOW" Minimize the output

"HIGH" Maximize the output

"HOLD" Holds the analog output to the value obtained just before the critical status condition occurred.

Step	Screen (English)	Screen (Japanese)	Procedure
1			Open the fail-safe mode for the analog output screen by following the steps to enter the engineering mode.
2			Touch the ⇨ key.
3			Use the ⇧ or ⇩ key to determine the fail-safe direction.
4			Touch the ⇨ key to move the cursor to the "#".

Selecting fail-safe mode for the pulse output

This function is used to determine the pulse output direction when the electromagnetic flowmeter detects a critical status condition.

⚠ CAUTION

The fail-safe mode is very important for overall safety of the control process. Choose the fail-safe direction carefully, as equipment damage can result from a wrong choice.

Default setting

"LOW"

Setting range

"LOW" Outputs no pulse

"HOLD" Holds the pulse to the value obtained just before the critical status condition occurred.

Step	Screen (English)	Screen (Japanese)	Procedure
1	12.3 % #FAIL SAFE MODE P.OUT LOW	12.3 % # イジョウショリ パルス LOW	Open the fail-safe mode for the pulse output screen by following the steps to enter the engineering mode.
2	12.3 % #FAIL SAFE MODE P.OUT LOW	12.3 % # イジョウショリ パルス LOW	Touch the ⇨ key.
3	12.3 % #FAIL SAFE MODE P.OUT HOLD	12.3 % # イジョウショリ パルス HOLD	Use the ⇧ or ⇩ key to determine the fail-safe direction.
4	12.3 % #FAIL SAFE MODE P.OUT HOLD	12.3 % # イジョウショリ パルス HOLD	Touch the ⇨ key to move the cursor to the "#".

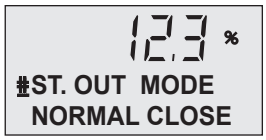
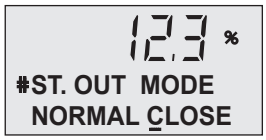
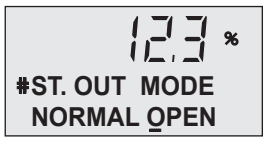
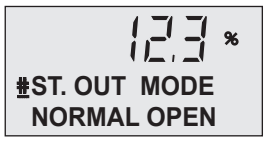
Setting the contact output status

This is used to set the contact output status for normal operation.

Important
This function is displayed when contact output has been selected.

Default setting
“CLOSE”

Setting range
“CLOSE”, “OPEN”
<For 1-contact input and 1-contact output>

Step	Screen (English)	Screen (Japanese)	Procedure
1			Open the contact output status setup screen by following the steps to enter the engineering mode.
2			Touch the ⇨ key
3			Use the ⇧ key to set the contact output status.
4			Touch the ⇨ key to move the cursor to the “#”.

<For 2-contact output>

Step	Screen (English)	Screen (Japanese)	Procedure
1	12.3 % #ST. OUT2 MODE NORMAL CLOSE	12.3 % # セッテンシュツリョク1 ノーマル CLOSE	Open the contact output status setup screen by following the steps to enter the engineering mode.
2	12.3 % #ST. OUT1 MODE NORMAL CLOSE	12.3 % # セッテンシュツリョク1 ノーマル CLOSE	Touch the ⇨ key
3	12.3 % #ST. OUT1 MODE NORMAL OPEN	12.3 % # セッテンシュツリョク1 ノーマル OPEN	Use the ⇩ and ⇧ keys to set the contact output status.
4	12.3 % #ST. OUT1 MODE NORMAL OPEN	12.3 % # セッテンシュツリョク1 ノーマル OPEN	Touch the ⇨ key to move the cursor to the "#".
5	12.3 % #ST. OUT2 MODE NORMAL CLOSE	12.3 % # セッテンシュツリョク2 ノーマル CLOSE	Use the ⇧ key to move the ST.OUT2 MODE screen.
6	12.3 % #ST. OUT2 MODE NORMAL CLOSE	12.3 % # セッテンシュツリョク2 ノーマル CLOSE	Touch the ⇨ key to set contact output 2 in the same way.

Damping time constant

The damping time constant removes minute fluctuations when transmitting the measured flow rate to the control equipment. Check the amplitude of fluctuation in flow output and set the damping time constant to an appropriate value. The new value becomes effective as soon as it is entered

Default setting

3.0 second.

Setting range

0.1 to 199.9 seconds.

(0.0 to 199.9 seconds for “Fast Response Option for Short Run Batch Process.”)

Step	Screen (English)	Screen (Japanese)	Procedure
7	12.3 % * MODE ENTER ADVANCED	12.3 % * モードヲイドウシマスカ？ アドバンスト　モード	Enter the ADVANCED mode. (See page 4-23).
8	0.0 % & DAMPING 003.0s	0.0 % & ダンピング 003.0S	Use the Touch ⇧ or ⇩ key to cycle through the screens until the damping screen appears.
9	0.0 % & DAMPING 003.0s	0.0 % & ダンピング 003.0S	Touch the ⇨ key until the cursor is at the value to be changed. (in the example, the key is touched three times.)
10	0.0 % & DAMPING 010.0s	0.0 % & ダンピング 010.0S	Use ⇧ or ⇩ key to change the numeric value. Touch and holding either key quickly increments or decrements the values.
11	0.0 % & DAMPING 010.0s	0.0 % & ダンピング 010.0S	Touch the ⇨ key until the cursor is back at the mode indicator. Touch the MODE key and hold for three seconds to return to MEASUREMENT MODE to save the Damping Time Value.

Manual zeroing

When piping vibration exists, process fluid slightly moves and display shows some values even though the fluid stands still. This function is used to adjust zero manually when the above phenomena occurs.

Important

Make sure to use the Manual zeroing function after using Auto zero function properly.

Manual zero is effective when the flow rate range is set as 0.2m/s or less.

When using the manual zeroing function, set damping time as 10 seconds or longer.

How to set

Verify the process fluid stands still. If the display shows some value, use the ⇧ or ⇩ key to adjust to 0%.

Step	Screen (English)	Screen (Japanese)	Procedure
1	0.0 % & MANUAL ZERO READY	0.0 % & マニュアルゼロ READY	Enter ADVANCED mode. (See page 4-23). Use the Touch ⇧ or ⇩ key to cycle through the screens until the Manual Zero screen appears.
2	0.0 % & MANUAL ZERO DOWN	0.0 % & マニュアルゼロ DOWN	Touch the ⇨ key to move the cursor to READY. Use the ⇧ or ⇩ key to adjust Zero. When the flow rate range is set as 0.2 m/s, value can be changed by 0.01% with every touch of ⇧ or ⇩ key.When the flow rate range is set as 0.1 m/s, value can be changed by 0.02% with every touch of ⇧ or ⇩ key.
3	0.0 % & MANUAL ZERO READY	0.0 % & マニュアルゼロ READY	Touch the ⇨ key to move the cursor to the “&”.
4			Touch the MODE key to save data.

Setting moving average

This function is used to carry out the moving average processing of the measured flow rate values. In this mode, the MGG10C/14C performs the flow rate calculation every 200 ms. For example, if the moving average process time is set to 2 seconds, the moving average processing will be carried out 2 sec./200 ms=10 times.

If pulsation are generated, this function can be used to suppress the flow rate fluctuations. Set the averaging time as the time of the pulsation period.

Default setting

OFF

Setting range

OFF or 1.0 s to 30.0 s

The moving average processing can be given by the following formula:

$$Qcurrent = \frac{\sum_{n=1} Qk}{k}$$.

Step	Screen (English)	Screen (Japanese)	Procedure
1	0.0 % & AVERAGING OFF	0.0 % & イドウヘイキン OFF	Enter ADVANCED MODE. (See page 4-23). Use the ⇧ or ⇩ key to cycle through the screens until AVERAGING screen appears.
2	0.0 % & AVERAGING OFF	0.0 % & イドウヘイキン OFF	Touch the ⇨ key to move the cursor to OFF.
3	0.0 % & AVERAGING ON 01.0s	0.0 % & イドウヘイキン ON @0.10s	Touch the ⇧ key to switch the OFF screen to the ON screen. Touch the ⇨ key to move the cursor to the value to be changed. Touch the ⇧ or ⇩ key to set a desired value
4	0.0 % & AVERAGING ON 01.0s	0.0 % & イドウヘイキン ON @0.10s	Touch the ⇨ key to move the cursor to back to the “&”.

Step	Screen (English)	Screen (Japanese)	Procedure
5			Touch the MODE key to return to the MEASURING MODE and save the data.

Auto spike cut function

This function eliminates steep noise spikes (spike noise) in the flow rate. Noise generated when solids hit the electrode is an example of the spike noise.

When the flow rate changes sharply, this function holds the outputs according to the damping time. Generally the spike noise occurs in a few milliseconds and settles down within the output holding time and the outputs are not affected. For ordinary flow rate changes, the output responds after the damping hold time.

It is not recommended to use this function for applications requiring high response and performance, e.g., the function should not be used when a pump frequently generates pulsation.

Default setting

OFF

Step	Screen (English)	Screen (Japanese)	Procedure
1			Enter the ADVANCED Mode. (See page 4-23). Use the ⇧ or ⇩ key to cycle through the screens until AUTO SPIKECUT screen appears.
2			Touch the ⇨ key to move the cursor to the OFF.
3			Touch the ⇧ key to switch the OFF screen to the AUTO screen.
4			Touch the ⇨ key to move the cursor to back to “&”.
5			Touch the MODE key to return to the MEASURING MODE and save the data.

Manual spike cut function

This function eliminates steep noise spikes (spike noise) in the flow rate. The manual spike cut function enables to set parameters, spike cut level and spike cut time to best meet the customers application.

Default setting

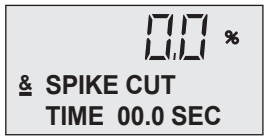
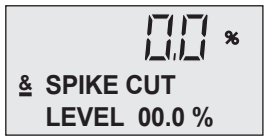
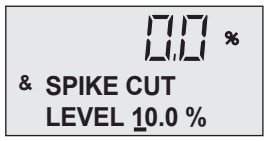
Spike cut time 0

Spike cut level 1.0

Setting range

Spike cut time: 00.0 to 99.9s

Spike cut level: 1.0 to 99.9%

Step	Screen (English)	Screen (Japanese)	Procedure
1	 	 	Enter the ADVANCED Mode. (See page 4-23).Use the ⇧ or ⇩ key to cycle through the screens until SPIKE CUT TIME or SPIKE CUT LEVEL screen appears.
2	 	 	Touch the ⇨ key to move the cursor to the value to be changed. Touch the ⇧ or ⇩ key to set a desired value.
3			Touch the MODE key to return to the MEASURING MODE and save the data.

Coefficient of compensation

This function changes the Coefficient, which multiplies the output flow rate in the main display.

Step	Screen (English)	Screen (Japanese)	Procedure
1	12.3 % & COEFFICIENT 1.0000	12.3 % & ホセイケイスウ 1.0000	Enter ADVANCED MODE (see page 4-23). Use the ⇩ or ⇧ key to cycle through the screens until the COEFFICIENT screen appears.
2	12.3 % & COEFFICIENT 1.0000	12.3 % & ホセイケイスウ 1.0000	Touch the ⇨ key until the cursor is at the value to be changed. **Default setting:** 1.0000 **Setting Range:** 0.1000 to 9.9999
3	12.3 % & COEFFICIENT 1.0050	12.3 % & ホセイケイスウ 1.0050	Touch the ⇩ or ⇧ key to change the value.
4	12.3 % & COEFFICIENT 1.0050	12.3 % & ホセイケイスウ 1.0050	Touch the ⇨ key until the cursor is back at the mode indicator.
5			Touch the MODE key and hold for three seconds to return to MEASUREMENT MODE to save the new value. **⚠ CAUTION** You must return to MEASURING MODE within two minutes to save this new value before the system resets it to the previously saved value.

Setting the drop-out

A drop out is set to prevent incorrect integration of the flow rate. Pulse counting will pause when the flow rate is at the preset percentage of the set range.

Default setting

2%

Setting range

0 - 10%

Step	Screen (English)	Screen (Japanese)	Procedure
1	12.3 % & DROP OUT 02 %	12.3 % & パルスドロップアウト 02 %	Enter ADVANCED MODE (see page 4-23). Use the ⇩ or ⇧ key to cycle through the screens until the DROPOUT screen appears.
2	12.3 % & DROP OUT 02 %	12.3 % & パルスドロップアウト 02 %	Touch the ⇨ key.
3	12.3 % & DROP OUT 05 %	12.3 % & パルスドロップアウト 05 %	Use the ⇩ and ⇧ keys to change the numbers.
4	12.3 % & DROP OUT 05 %	12.3 % & パルスドロップアウト 05 %	Touch the ⇨ key to move the cursor to the “&”.
5			Touch the MODE key return to the MEASURING MODE and save the data.

Setting the low flow cut

This function is used to set the low flow cutoff value.

When the flow rate reaches set value, the analog output is cutoff and the display is latched to zero to avoid errors due to flow pulsation in range value closed to zero.

Default setting
OFF

Setting range
OFF or ON 0% - ON 10%

Step	Screen (English)	Screen (Japanese)	Procedure
1	12.3 % & LOW-FLOW CUT OFF	12.3 % & ローフローカット OFF	Open the low flow cut setup screen by following the steps to enter the advanced mode.
2	12.3 % & LOW-FLOW CUT OFF	12.3 % & ローフローカット OFF	Touch the ⇨ key to move the cursor to OFF.
3	12.3 % & LOW-FLOW CUT ON 00%	12.3 % & ローフローカット ON	By touching the ⇧ key, the "OFF" message will change to "ON". Now you can enter the low flow cut in a numerical value.
4	12.3 % & LOW-FLOW CUT ON 00%	12.3 % & ローフローカット ON 00%	Touch the ⇨ key, and the cursor will moves to the numerical figures.
5	12.3 % & LOW-FLOW CUT ON 05%	12.3 % & ローフローカット ON 05%	Use the ⇩ and ⇧ keys to select the desired numbers.
6	12.3 % & LOW-FLOW CUT ON 05%	12.3 % & ローフローカット ON 05%	Touch the ⇨ key to move t.he cursor to the "&".
7			Touch the MODE key return to the MEASURING MODE and save the data.

Setting decimal place

This function is used to set the decimal place. The decimal place is related to the flow rate range.

Default setting

Same as the setting flow rate range or DECIMAL PLACE:2

Setting range

DECIMAL PLACE (Single range): 0 to 4

DECIMAL PLACE (Dual or Normal/Reverse range): 0 to 4

Step	Screen (English)	Screen (Japanese)	Procedure
1	0.0 % & DECIMAL PLACE 0	0.0 % & ショウスウテンイチ 0	Enter ADVANCED MODE (see page 4-23). Use the ⇩ or ⇧ key to cycle through the screens until DECIMAL PLACE appears.
2	0.0 % & DECIMAL PLACE 1	0.0 % & ショウスウテンイチ 1	Touch the ⇨ key to move the cursor to the number. Use the ⇩ or ⇧ key to set the desired number.
3	0.0 % & DECIMAL PLACE 1	0.0 % & ショウスウテンイチ 1	Touch the ⇨ key to move the cursor to back to “&”.
4			Touch the MODE key to return to the MEASURING MODE and save the data.

Change the excitation frequency

This function is used to change the excitation frequency.

Important

The excitation frequency is determined by the power supply frequency. Selectable frequencies are 1/8, 1/4 and 1/2 of power supply frequency. Lower frequency has better zero stability and higher frequency is suitable for slurry applications. “Default: 1/4 of power supply frequency”.

Step	Screen (English)	Screen (Japanese)	Procedure
1	0.0 % & EX FREQUENCY 12.5 Hz	0.0 % & レンジシュウハスウ 12.5 Hz	Enter ADVANCED MODE (see page 4-23). Use the ⇩ or ⇧ key to cycle through the screens until the EX FREQUENCY screen appears.
2	0.0 % & EX FREQUENCY 12.5 Hz	0.0 % & レイジシュウハスウ 12.5 Hz	Touch the ⇨ key to move the cursor to the frequency value.
3	0.0 % & EX FREQUENCY 25 Hz	0.0 % & レイジシュウハスウ 25 Hz	Use the ⇩ or ⇧ key to set a desired frequency.
4	0.0 % & EX FREQUENCY 25 Hz	0.0 % & レイジシュウハスウ 25 Hz	Touch the ⇨ key to move the cursor to back to “&”.
5			Touch the MODE key to return to the MEASURING MODE and save the data.

~ Note *The device is calibrated with the excitation frequency which is 1/4 of power supply frequency. Other excitation frequency may affect accuracy.*

~ Note *In the areas with 60Hz power supply, excitation frequency selections are 7.5Hz, 15Hz, 30Hz.*

~ Note *In some slurry applications, excess output noise may be present. Switching to a higher excitation frequency may reduce this output noise providing a more stable signal. It should be noted that changing to a higher frequency may introduce measurement error of a few percent. Please contact Yamatake for assistance before utilizing this feature.*

Setting the analog output limit

This function is used to activate analog output limit. The analog output limit is determined by the values set by the HI/LO alarm function.

Default setting

OFF

When this function is set as ON, the analog output is output between values set as HI/LO alarm function.

Step	Screen (English)	Screen (Japanese)	Procedure
1	0.0 % & I. OUT LIMITER OFF	0.0 % & 4 - 20 セイゲン OFF	Enter ADVANCED MODE (see page 4-23). Use the ⇩ or ⇧ key to cycle through the screens until the I.OUT LIMITER screen appears.
2	0.0 % & I. OUT LIMITER OFF	0.0 % & 4 - 20 セイゲン OFF	Touch the ⇨ key to move the cursor to the OFF.
3	0.0 % & I. OUT LIMITER ON	0.0 % & 4 - 20 セイゲン ON	Use the ⇩ or ⇧ key to switch the OFF to ON.
4	0.0 % & I. OUT LIMITER ON	0.0 % & 4 - 20 セイゲン ON	Touch the ⇨ key to move the cursor to back to "&".
5			Touch the MODE key to return to the MEASURING MODE and save the data.

Change the flow direction

This function is used when the detector is installed in opposite direction to the flow direction.

Default setting

FORWARD (the direction mark on the detector matches the direction of flow.)

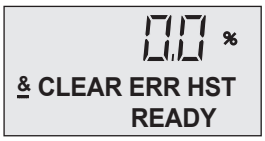
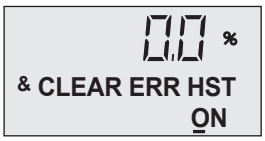
Step	Screen (English)	Screen (Japanese)	Procedure
1	0.0 % & FLOW DIRECTION FORWARD	0.0 % & ナガレホウコウ FORWARD	Enter ADVANCED MODE (see page 4-23). Use the ⇧ or ⇩ key to cycle through the screens until the FLOW DIRECTION screen appears.
2	0.0 % & FLOW DIRECTION FORWARD	0.0 % & ナガレホウコウ FORWARD	Touch the ⇨ key to move the cursor to FORWARD
3	0.0 % & FLOW DIRECTION REVERSE	0.0 % & ナガレホウコウ REVERSE	Touch the ⇧ or ⇩ key to switch the “FORWARD” to the “REVERSE”.
4	0.0 % & FLOW DIRECTION REVERSE	0.0 % & ナガレホウコウ REVERSE	Touch the ⇨ key to move the cursor to back to “&”.
5			Touch the MODE key to return to the MEASURING MODE and save the data.

Error history check/clear

The latest eight errors can be checked.

Error display

If there is no error, [1 NO ERROR] is displayed.

Step	Screen (English)	Screen (Japanese)	Procedure
1			Enter ADVANCED MODE (see page 4-23). Use the ⇧ or ⇩ key to cycle through the screens until “ERROR HISTORY” screen appears.
2			If the screen displays other than “NO ERRORS”, touch the ⇨ key to move the cursor at the number.
3			Use the ⇧ or ⇩ key to change the number and check the error history.
4			Touch the ⇨ key to move the cursor to back to “&”. Touch the ⇧ key once and display the “CLEAR ERR HST” screen.
5			Touch the ⇨ key to move the cursor to “READY”. Touch the ⇧ key to clear the error history.
6			Touch the ⇨ key to move the cursor to back to “&”.
7			Touch the MODE key to return to the MEASURING MODE and save the data.

Chapter 5: Maintenance and Troubleshooting

This chapter contains the maintenance and inspection procedures for the flowmeter and troubleshooting.

Output signal loop check:

- Analog output
- Pulse output
- Excitation current

Simulated signal input by the calibrator

Regarding the operations through SFC communicator, refer to the users manual CM2-MGG000-2001.

Function check

Input and output signal loop check

The analog output can be checked by using the electromagnetic flowmeter as a constant-current generator.

By using this function, loop check and wiring check can be done.

Other instruments in the loop, such as recorders and controllers can be checked.

Check items

- Analog output
- Pulse output
- Contact input/output
- Excitation current

Analog output check

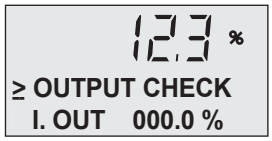
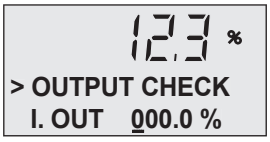
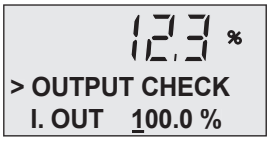
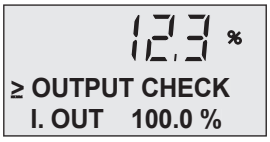
The analog output can be checked by using the electromagnetic flowmeter as a constant-current generator.

Default setting

Existing analog output

Setting range

000.0 to 115.0%

Step	Screen (English)	Screen (Japanese)	Procedure
1			Enter MAINTENANCE MODE (see page 4-24).Use the ⇧ or ⇩key to cycle through screen until "OUTPUT CHECK" screen appears. Touch the ⇨ key once to move the cursor to "OFF". Touch the ⇧ key to switch the OFF screen to ON screen.
2			Touch the ⇨ key to move the cursor at the percent value to be checked.
3			Use the ⇧ or ⇩key to set the desired value. In this example, the analog output is set as 100%, i.e. 20mA.
4			Touch the ⇨ key to move the cursor to ">".
5			Use the ⇧ or ⇩key to move other screen. Then the analog output is back to the value according to the measured flow rate.

~ Note *If no operation is done for ten minutes, the output check mode automatically finishes and return to the Measuring mode.*

Pulse output check

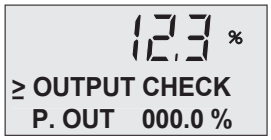
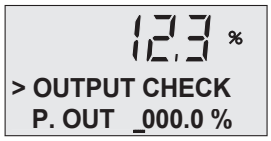
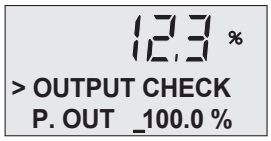
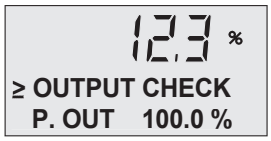
The pulse output can be checked by using the electromagnetic flowmeter as a pulse generator.

Default setting

Existing measured value

Setting range

000.0 to 115.0%

Step	Screen (English)	Screen (Japanese)	Procedure
1			Enter MAINTENANCE MODE (see page 4-24).Use the ⇧ or ⇩key to cycle through screen until “OUTPUT CHECK I.OUT” screen appears. Touch the ⇨ key once to move the cursor to “OFF”. Touch the ⇧ key to switch the OFF screen to ON screen. Touch the ⇧ key once to move to “OUTPUT P. OUT” screen.
2			Touch the ⇨ key to move the cursor at the percent value to be checked.
3			Use the ⇧ or ⇩key to set the desired value. In this example, the pulse equivalent to the 100% flow rate is output.
4			Touch the ⇨ key to move the cursor to “>”.
5			Use the ⇧ or ⇩key to move other screen. Then the pulse output is back to the value according to the measured flow rate.

~ Note *If no operation is done for ten minutes, the output check mode finishes automatically and return to the Measuring mode.*

Contact input/output loop check

By switching contact input terminal ON/OFF, contact input terminal status can be checked through the LCD.

By switching contact output terminal ON/OFF, contact output loop can be checked.

Display varies according to the selection of contact input and output.

Default setting

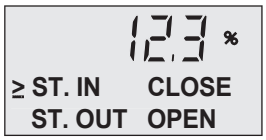
Display the existing status

Setting range

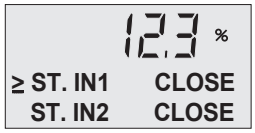
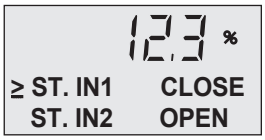
“CLOSE”, “OPEN”

<Contact input and contact output>

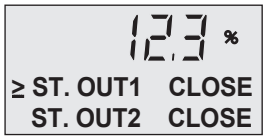
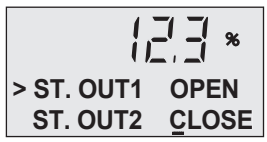
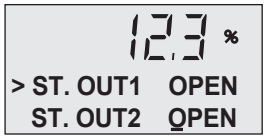
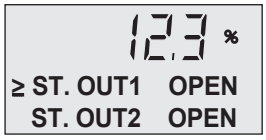
Step	Screen (English)	Screen (Japanese)	Procedure
1	12.3 % ≥ ST. IN OPEN ST. OUT CLOSE	12.3 % ≥ シュツリョクチェック 4 - 20 000.0 %	Enter MAINTENANCE MODE (see page 4-24).Use the ⇧ or ⇩key to cycle through screen until “OUTPUT CHECK” screen appears. Touch the ⇨ key once to move the cursor to “OFF”. Touch the ⇧ key to switch the OFF screen to ON screen. Touch the ⇧ key twice to move to “OUTPUT CHECK ST. IN/OUT” screen.
2	12.3 % > ST. IN OPEN ST. OUT CLOSE	12.3 % > シュツリョクチェック 4 - 20 000.0 %	Touch the ⇨ key to move the cursor at the status (OPEN/ CLOSE).
3	12.3 % > ST. IN CLOSE ST. OUT OPEN	12.3 % > シュツリョクチェック 4 - 20 100.0 %	Use the ⇧ key to select the desired output status (OPEN/ CLOSE).
4	12.3 % > ST. IN CLOSE ST. OUT OPEN	12.3 % > シュツリョクチェック 4 - 20 100.0 %	For the contact input, the display indicates current contact input status (OPEN/CLOSE).

Step	Screen (English)	Screen (Japanese)	Procedure
5			Touch the ⇨ key to move the cursor to ">".
6			Use the ⇧ or ⇩key to move other screen. Then the contact input and output are back to the current status (OPEN/CLOSE).

<2-contact inputs>

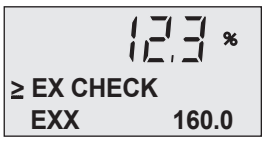
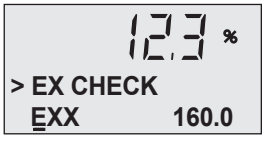
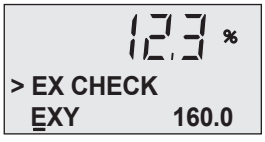
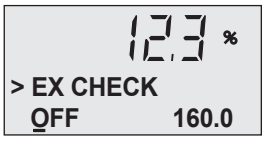
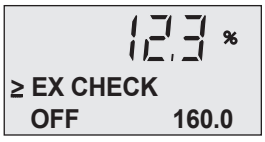
Step	Screen (English)	Screen (Japanese)	Procedure
1			Enter MAINTENANCE MODE (see page 4-24).Use the ⇧ or ⇩key to cycle through screen until "OUTPUT CHECK" screen appears. Touch the ⇨ key once to move the cursor to "OFF". Touch the ⇧ key to switch the OFF screen to ON screen. Touch the ⇧ key twice to move to the "OUTPUT CHECK ST. IN" screen.
2			The display indicates the current contact input status (OPEN/ CLOSE).

<2-contact outputs>

Step	Screen (English)	Screen (Japanese)	Procedure
1			Enter MAINTENANCE MODE (see page 4-24).Use the ⇧ or ⇩key to cycle through screen until “OUTPUT CHECK” screen appears. Touch the ⇨ key once to move the cursor to “OFF”. Touch the ⇧ key to switch the OFF screen to ON screen. Touch the ⇧ key twice to move to the “OUTPUT CHECK ST. OUT” screen.
2			Touch the ⇨ key to move the cursor at the status (OPEN/ CLOSE).
3			Use the ⇨ key to move the cursor at the status (OPEN/ CLOSE).
4			Touch the ⇨ key to move the cursor to “>”.
5			Use the ⇧ or ⇩key to move the other screen. Then the contact input and output are back to the current status (OPEN/CLOSE).

Excitation current check

This function is used to check the excitation current.

Step	Screen (English)	Screen (Japanese)	Procedure
1			Enter MAINTENANCE MODE (see page 4-24). Use the ⇧ or ⇩key to cycle through screen until “OUTPUT CHECK” screen appears. Touch the ⇨ key once to move the cursor to “OFF”. Touch the ⇧ key to switch the ON screen. Touch the ⇧ key three times to move the “EX CHECK” screen. In this status, the excitation current runs from X to Y. Verify the excitation current is 160mA.
2			Touch the ⇨ key once to move the cursor at the “E” of “EXX”.
3			Touch the ⇧ key once, then the excitation current runs from Y to X.
4			Touch the ⇧ key once, then the excitation current stops.
5			Touch the ⇨ key once to move the cursor to “>”.
6			Use the ⇧ or ⇩key to move to the other screen. Then the excitation current is added to the coil to measure the flow rate.

Simulated signal by the calibrator

The model MGZ14 calibrator is available for this converter. The calibrator inputs the simulated signal to the converter. By using the calibrator, the converter function can be checked.

Preparation

Calibrator and cables

Digital voltmeter

Resister (250Ω)

By following the users manual of the calibrator CM2-MGZ100-2001, check the converter.

Troubleshooting

Overview

Introduction

If a problem occurs at Electromagnetic Flowmeter start-up and operation, the following four causes should be considered:

- Misapplication of the electromagnetic flowmeter
- Wrong setting or wrong operation
- Electromagnetic Flowmeter malfunction
- Improper wiring

If a problem occurs during operation, the device's self-diagnostic function will classify it as critical or non-critical. It will indicate this and respond accordingly.

Perform the proper correction measures, referring to the troubleshooting guidelines described in this section.

Critical failures

Critical problems may disrupt Electromagnetic Flowmeter operation, if not corrected, ultimately damage the Flowmeter. When critical trouble occurs during Electromagnetic Flowmeter operation, an error message will appear on the converter's display panel and the Flowmeter will continue to output the preset value in the abnormality treatment (fail-safe) direction. The error message and the self-diagnostic results will be visible on the display panel.

Example:

CPU CHECK ERROR: This massage appears if the ROM or RAM is in abnormal condition.

Non-critical failures

Non-critical problems will not seriously affect Electromagnetic Flowmeter operation. When an error occurs during Electromagnetic Flowmeter operation and is regarded as a non-critical problem by the converter self-diagnostics, the output will not burn-out and the Electromagnetic Flowmeter will continue to output the measured value.

Errors at startup

When a problem occurs at start-up, perform the procedures listed in the following table. If the problem persists, the flowmeter may be damaged and you should contact technical support. (For technical support, contact your Yamatake sales representative in your area.)

Table 5-1 Startup Errors

Symptom	Check Points and Treatment
No display after power on.	• Check the converter power supply specification and ensure that the power supply being supplied meets these requirements. • Make sure the ambient temperature is not below -25 °C (13 °F).
No output after power-on.	• Verify that the signal line is correctly connected.
Communication can not be done.	• Check the switch position.Refer to the Figure 2-15. • Check if the wiring is properly completed. • Check if the SFC is properly connected. • Check if the S/W version of the SFC is Ver.7.0 or later. • Check if the HART communicator is 375. Check if the DD file is downloaded.
No pulse output.	• Check the wiring of the pulse output loop. • Check the receiving device specifications. (pulse width, frequency, voltage drop). • Check if the pulse output is open collector type or Drive counter.
Output remains 0mA.	• Verify that power source and power supply voltage. • Verify the wiring. Refer to the Figure 2-15.

Operation errors

When a problem occurs during operation:

Check against the table on this page for symptoms of the error. If found, perform the steps indicated in the table. If the problem persists, the flowmeter may be damaged and you should contact technical support. (For technical support, contact your Yamatake sales representative in your area.)

Table 5-2 Operation Errors

Symptom	Check Points and Treatment
Output fluctuates excessively beyond the estimated flow rate range.	• Verify that the detector is properly grounded. • Verify that the converter is properly grounded. • Verify that the damping time constant is set correctly. If not, set the an appropriate damping time constant. • Clean the electrodes.
Flow rate exceeds the flow range	• Check the flow range setting and make sure it is set to match the detector and process flow. If not, set an appropriate RANGE. • Check that the flowmeter has been zeroed. If not, calibrate the flowmeter.
Output exceeds 100%.	• Verify that the set range is set correctly. • Verify that the span is set correctly. • Verify that the zero point is correctly adjusted. • Verify that the converter is correctly calibrated.
Output remains 0%.	• The pipe may be empty. Use the empty detection function to check whether or not the pipe is empty. (If it is empty, the empty detection function will be functioning.) • Verify that the signal cable is correctly connected. • Verify that the valves are open on the upper and lower sides. • Verify that the span is set correctly. • Verify that the converter is set to the constant current mode. • Verify that the flow rate is not in the low flow cutoff range.
Output is in the fail-safe mode.	• Check the error code.
Pulse output is too large or too small.	• Verify if the pulse weight and width are set correctly. • Verify the converter is correctly calibrated. • Verify the pulse counter is proper. • Verify the dropout value is correctly set between 0 and 10%.

Error messages

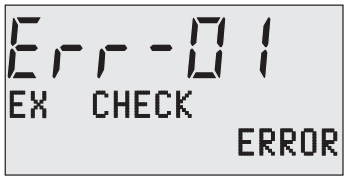
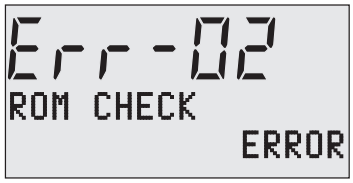
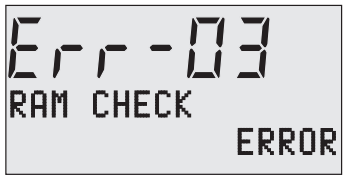
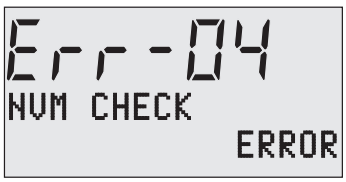
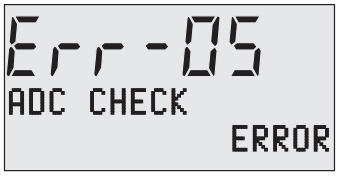
Error messages are grouped by the severity of the problem. There are messages for non-critical problems and for critical problems.

Error codes for critical problems

Critical problems can disrupt flowmeter operation and ultimately damage the flowmeter if not corrected. When critical trouble occurs during operation, an error message appears on the converter's display panel and the flowmeter continues to output the preset value in the fail-safe direction. The error message and the self-diagnostic results are visible on the display panel.

The following table shows the possible error codes for critical problems and what to do. If the problem persists after trying these solutions, contact technical support. (For technical support, contact your Yamatake sales representative in your area.)

Table 5-3 Critical Errors

Error Screen	Error	Solution
	EX check Error (Excitation circuit is open.)	• Check connection of terminal/wiring of X and Y. • Check if the resistance of coil is less than 50 Ω. (Coil resistance is to be checked between X and Y terminal of a detector.) • Cycle power.
	ROM check error	• Cycle power. • Replace the ROM. • Replace main card.
	RAM read after write error	• Cycle power. • Replace main card.
	NVM read after write error	• Cycle power. • Replace main card.
	ADC error A/D change error	• Cycle power. • Replace main card.

Error codes for non-critical problems

Non-critical problems do not seriously disrupt flowmeter operation. When an error occurs during operation and is regarded by the system as a non-critical problem, the flowmeter continues to output the flow rate.

The following table shows the possible error codes for non-critical problems and what to do. If the problem persists after trying these solutions, contact technical support. (For technical support, contact your Yamatake sales representative in your area.)

Table 5-4 Non-critical

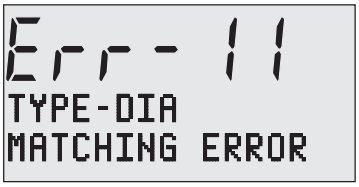
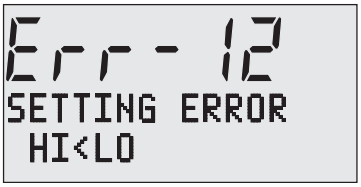
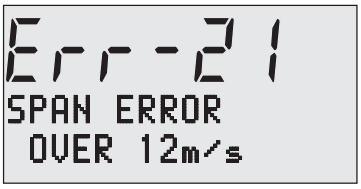
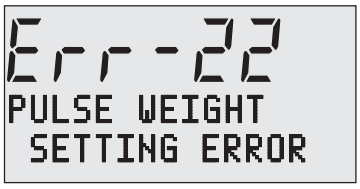
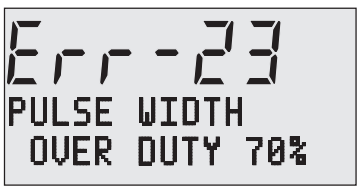
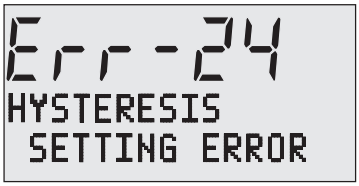
Error Screen	Error	Solution
	Detector type and diameter do not match.	• Check the setting for the detector diameter and enter the correct diameter.
	High/low limit alarm error. HI < LO	• Set HI > LO.
	The span setting is greater than 12 m/s.	• Check the SPAN setting. • Check the DIA setting. • Check the TYPE setting • Check the DUMMY setting.
	The pulse frequency is either too high or too low.	• Check the pulse weight setting. • Check the pulse frequency setting. • Check the engineering unit match span unit.
	Pulse width too large. Duty 70% or more at pulse frequency output.	• Check 1. Pulse width 2. Pulse weight and 3. Span setting

Table 5-4 Non-critical

Error Screen	Error	Solution
	Hysteresis exceeding 100% of range in normal/ reverse automatic range	• Check hysteresis setting.

Safety precautions

Introduction

Correct operation is necessary for the safe and efficient use of the SFC and MagneW3000 FLEX Carefully read the safety precautions described in this user's manual and have a thorough understanding of it before operating the product.

Operating precautions

For safe use of the instrument, this manual uses the following symbols:

⚠ WARNING
Denotes a potentially hazardous situation, which is not avoided could result in death or serious injury.

⚠ CAUTION
Denotes a potentially hazardous situation which if not avoided could result in minor injury or damage to device.

Examples of symbol

	The symbol indicates a specific action that is prohibited to prevent danger. The prohibited action (prohibition of dismantling in the case of the figure at left) is indicated by a symbol or next to the symbol.
	The symbol indicates a specific action that is mandatory to prevent danger. The mandatory action (the plug should be removed from the socket in the case of the figure at left) is indicated by a symbol.

⚠ CAUTION
Set the loop of the electromagnetic flow meter whose setting is to be changed to “manual” before starting communication with the SFC. Its output may change due to a communication signal, affecting the operation or control of the plant.

⚠ CAUTION
Do not throw the battery for the SFC into fire. This may result in explosion. Be sure to remove the AC adapter for the SFC from the socket if it is not used. The AC adapter may be over heat.

Structure and functions of SFC

This section presents the structure and functions of the Smart Field Communicator SFC.

- Describes the key types, brief functions of keys, which are color-coded, and general rules of key operations of the SFC.
- Describes names and functions of the SFC keys.

~ Note *For the method of connection between the SFC and MagneW3000 Flowmeter, see the user's manual of the MagneW3000 Flowmeter.*

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